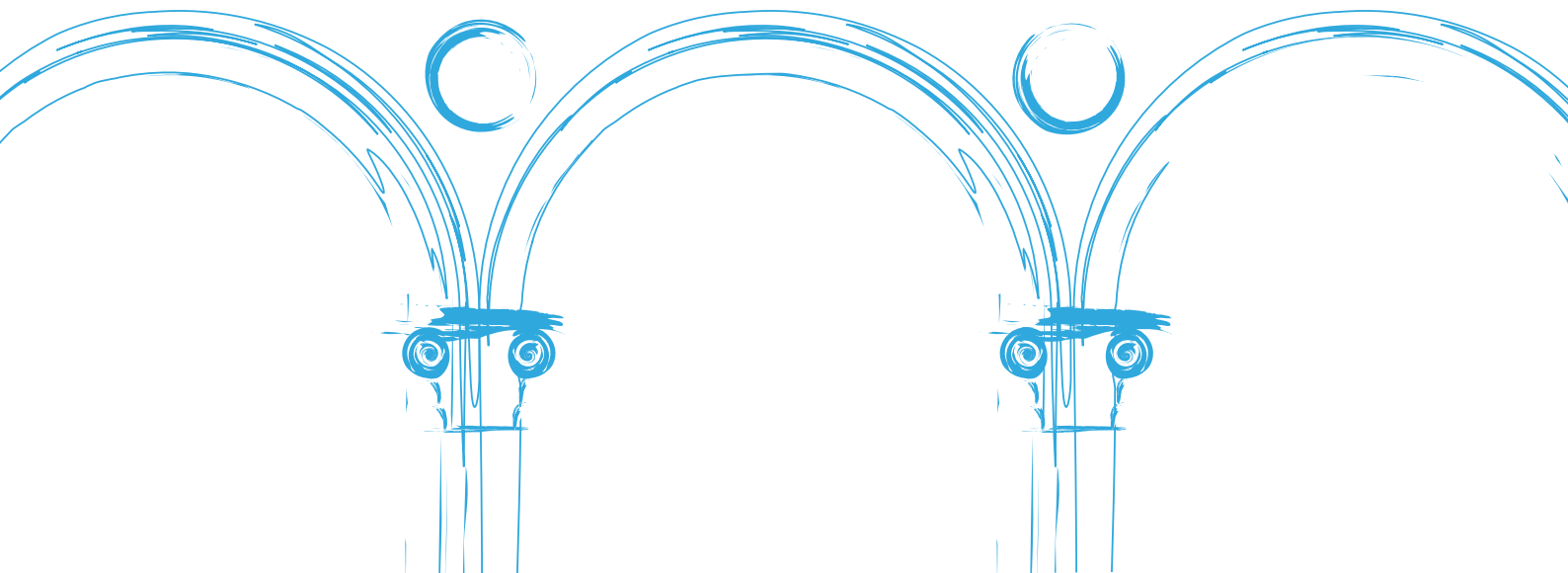


# The Provision of Assistive Technology to Children with Disabilities in Humanitarian Settings

A Review of the available evidence on the current  
state of provision, gaps in evidence, and barriers to  
and facilitators of better delivery

Golnaz Whittaker and Gavin Wood

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THE PROVISION OF ASSISTIVE TECHNOLOGY TO CHILDREN WITH DISABILITIES IN HUMANITARIAN SETTINGS: A REVIEW OF THE AVAILABLE EVIDENCE ON THE CURRENT STATE OF PROVISION, GAPS IN EVIDENCE, AND BARRIERS TO AND FACILITATORS OF BETTER DELIVERY

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ABSTRACT

The World Health Organization estimates that 1 billion people in the world live with a disability, of whom UNICEF estimates 240 million are children. The majority of the world's children with disabilities live in low- and middle-income countries, where humanitarian crises are most likely to occur. Humanitarian crises increase the prevalence of child disability and the need for assistive technologies (AT) as children sustain new disabling injuries, children with disabilities lose their assistive devices, or access to limited existing health services is worsened by crisis. In addition, there are likely to be many more children with disabilities in humanitarian settings whose need for AT has never been identified. This literature review discusses the barriers to AT provision in humanitarian settings and considers possible entry points for provision in future. Recommendations include: coordination platforms for the provision of AT; gathering evidence on existing in-country AT provision and strengthening those systems; designing programmes for AT provision that account for pre-existing barriers, within-crisis barriers including those internal to humanitarian organisations like UNICEF.

## Contents

Contents .....	2
Acronyms .....	3
1. Policy brief .....	4
2. Methodology .....	6
3. The scope of the problem: what is known about the need for AT in humanitarian settings? 7	
3.1 Humanitarian settings in the scope of this report .....	7
3.2 What are the evidence gaps relating to AT need?.....	18
4. The state of play: what is known about AT provision for children in humanitarian settings? 20	
4.1 Frameworks and guidance governing AT provision in humanitarian action .....	20
4.2 What do we know about AT provision in current and historical crises? .....	21
4.3 What are the evidence gaps relating to the current provision of AT in humanitarian settings?.....	26
5. Barriers to AT provision and access.....	27
5.1 Pre-crisis barriers .....	27
5.2 Within-crisis barriers (external to the humanitarian system).....	30
5.3 Within-crisis barriers (internal to the humanitarian system) .....	31
5.4 Assistive technologies: by nature a hard problem? .....	37
5.5 What are the evidence gaps relating to the barriers to AT provision in humanitarian settings?.....	39
6. Facilitators of provision: what is known about what works?.....	40
6.1 Principles for improved healthcare services in humanitarian crises .....	41
6.2 Scaling up AT access must be underpinned by improved data systems .....	43
6.3 Integrating rehabilitation into emergency response .....	45
6.4 Coordination of humanitarian response structures to improve AT access .....	46
6.5 Stockpiling.....	46
6.6 Community based rehabilitation: Bringing services closer to beneficiaries.....	47
6.7 Best practice in selecting appropriate AT.....	49
6.8 What are the evidence gaps relating to the facilitators of AT provision in humanitarian settings?.....	50
Closing remarks.....	50
Annex 1: Summary of studies with findings related to facilitators of AT provision.....	53
References.....	57

Acronyms

AT	Assistive Technology/Assistive Technologies
ATA	WHO Assistive Technology Assessment tool
ATA-N	WHO Assistive Technology Assessment tool - Needs
ATA-S	WHO Assistive Technology Assessment tool - Survey
CBR	Community-Based Rehabilitation
CRPD	Convention on the Rights of Persons with Disabilities
DPO	Disabled People's Organization
DRR	Disaster Risk Reduction
DVFP	Disaster Vulnerability Focal Points
EMTs	Emergency Medical Teams
ERW	Explosive Remnants of War
HI	Humanity and Inclusion
HICs	High Income Countries
HNO	Humanitarian Needs Overview
HRPs	Humanitarian Response Plans
IASC	Inter-Agency Standing Committee
IBR	Institution Based Rehabilitation
ICRC	International Committee of the Red Cross
IED	Improvised Explosive Device
IR&D	Injury Rehabilitation and Disability
LMICs	Low- and middle-income countries
MICS	Multiple Indicator Cluster Surveys
NGO	Non-governmental Organization
RRPs	Refugee Response Plans
SEIPH	Secretariat for the Inclusion of Persons with Handicaps
TQ	Ten Questions tool
UNDP	United Nations Development Programme
UNHCR	United Nations High Commissioner for Refugees
UNICEF	United Nations Children's Fund
WASH	Water, Sanitation and Hygiene
WHO	World Health Organization

## 1. Policy brief

**Overview:** The World Health Organization (WHO) estimates that 1 billion people in the world live with a disability. UNICEF estimates that almost 240 million are children. Humanitarian emergencies disproportionately occur in contexts with the highest existing prevalence of child disability, and further increase the rate of child disability (1). In those countries, the availability of assistive technologies (AT) by the state is very low (2). Assistive technologies encompass the systems, services and products that enhance the functioning of people with impairments and prevent them from acquiring secondary health conditions. Critically, AT enable children to participate in education, family and community life.

When emergencies occur in many low- and middle-income countries (LMICs), national resources to respond are often quickly overwhelmed, leading to a humanitarian crisis typically requiring international assistance and coordination. In those settings, where AT is needed most, the barriers to provision are likely to be highest. Failure to provide children with the AT they need can lead to exclusion from a number of services, most notably education (3), but also WASH facilities, nutrition, as well as lifelong societal exclusion and increased vulnerability to harm. The Convention on the Rights of Persons with Disabilities (CRPD) asserts the responsibility of governments and the international community to make AT available to everyone who needs it (4). This thematic review provides a summary of evidence from the literature regarding the nature and scale of AT provision in crises where a humanitarian response is in place, and the barriers and facilitators to provision in those settings.

**Approach:** We examine the available evidence regarding AT provision to children in humanitarian settings where international humanitarian response is in place, including camp-based settings. We conducted electronic searches in databases to identify the relevant English-language academic literature from the past decade, using search terms identified in collaboration with subject-matter experts. We identified 351 items that were considered relevant to the themes of this review.

**Findings:** Most of the academic evidence, on the nature and impact of AT provision in crises, is limited to the acute stage of a humanitarian crisis. Acute-stage provision most commonly comprises provision of mobility aids to those survivors of disaster who are treated by Emergency Medical Teams (EMTs) particularly through provision of prosthetics. There is little evidence in the literature of systematic provision of other assistive devices (visual, hearing, communicative and cognitive aids) to children with disabilities. Even less is known about the experience of adolescents and their met or unmet AT needs.

We found limited examples of AT needs being considered in the international communities' Humanitarian Response Plans (HRPs) to date. Currently, it is untested whether increased guidance on disability inclusion and AT access will lead to increased AT-related planning in HRPs, or increased allocation of funding to AT programming.

We identified evidence of a range of interconnected barriers to provision in humanitarian settings at three levels: barriers that preceded the crisis (including stigma against children with disabilities), barriers within the crisis that were external to the humanitarian response (including weakened health infrastructure) and barriers within the crisis that were internal to the humanitarian response. This last group was an important focus of the review, as barriers resulting from the gaps, structures and incentives within humanitarian response approaches are (theoretically) within the control of that system and can be tackled; in other words, United Nations agencies and their partners can work towards minimizing those barriers. Such barriers include the failure of humanitarian response to prioritize the needs of people with disabilities, weak coordination of AT provision and the failure to identify all those with AT needs.

**Conclusions:** There is a gap between AT needs and AT provision in international humanitarian response, not least due to those settings presenting certain challenges including worsened transport and road infrastructure, weak rehabilitation systems and stigma. Humanitarian coordination systems provide a suitable pre-existing platform for strengthening AT provision and coordination, and making decisions on key accountability issues.

Three gaps require attention in current humanitarian provision for children with disabilities:

1. It is likely that children with pre-existing disabilities are often excluded from the already limited AT provision that exists as part of humanitarian response.
2. There is relatively little evidence of effort to meet the specific needs of children with disabilities, including their need for AT, even though programming is increasingly making mainstream humanitarian facilities more inclusive.
3. Prevailing AT provision focuses primarily on mobility impairments, overlooking other impairments (including cognitive, communicative, hearing, visual).

There is a relative dearth of academic publications on this topic, which makes it difficult to draw definitive conclusions regarding the scale and nature of AT provision, particularly beyond the acute phase of humanitarian response. More research is needed to understand the scale and quality of AT provision in humanitarian settings, as well as the effectiveness of different approaches to provision.

In conclusion, this review highlights the need to incorporate AT products and services into emergency preparedness planning and humanitarian response. The report recommends strengthening existing AT provision; coordination of AT provision; and the gathering of evidence on existing AT needs, demand and provision. Programmes should also be designed for AT provision that accounts for pre-existing and external barriers, with a focus on minimizing internal barriers, such as clarifying accountability and designating responsibilities for key actions like dedicated needs assessments, procurement and supply.

## 2. Methodology

This thematic review sets out the available academic knowledge on access to and provision of AT to children and adolescents in humanitarian settings. It is based on a literature review using the following search terms:

“disab\*” and “humanitarian respons\*”; (“humanitarian cris\*; humanitarian intervention\*”; “humanitarian action\*”) “unicef”; “child\*”; “adolescent\*” “un agency”; “disaster\*”; “conflict\*”, “crisis”; “impair\*”; “injury”; “assistive technolog\*” (“assistive devices”; “assistive products”) “occupational therap\*”; “physiotherapy\*”; “prosthe\*”; “ortho\*”; “market shaping”; “disaster medic\*”; “emergency medic\*”; “rehabilitat\*”. These search terms were selected to capture as many examples of AT provision in crises as possible. We employed AND, OR operators with variations of the chosen terms.

Searches and database management were conducted in coordination between three reviewers (one UNICEF consultant, one member of the Global Disability Innovation (GDI) Hub and one research student), as GDI Hub planned to conduct research on a related theme using the same body of literature. This literature review was conducted by UNICEF Office of Research – Innocenti.

Electronic searches were conducted in the following databases: Cochrane Library; ERIC (ProQuest); Global; Index Medicus; Google Scholar; Health and Psychosocial Instruments (HAPI); MEDLINE (Ovid); Middle East and Africa database (ProQuest); Political Science database (ProQuest); Public Health Database (ProQuest); PubMed; Social Policy and Practice. These databases were chosen based on their wide use in health care research and humanitarian and development research. Our literature review included only articles that were (a) written in English, which was recognized as a limitation; (b) written between January 2010 and the date of the search (June 30<sup>th</sup>, 2020). As AT provision is a relatively new area of research and practice in the humanitarian sector, articles over ten years old were considered less likely to provide relevant evidence to guide current practice.

All documents meeting the inclusion criteria were downloaded into Mendeley reference management software and duplicate titles were removed. Two reviewers independently chose which articles to exclude; the reviewers discussed any cases in which they disagreed and used a third reviewer as a judge to resolve any disagreements. All literature focused exclusively on immediate surgical response and emergency medical treatment without reference to AT provision or rehabilitation were excluded. All literature on high income countries (HICs) based on the World Bank country classifications were also excluded. Given the paucity of the literature, all literature dealing with study design was retained. Book chapters were also included where they were freely available online as well as commentaries, opinion pieces, first-hand accounts and conference proceedings if they were published in reputable journals. Literature that was not accessible at the time of the review was excluded (including, for example, book sections, which during the 2020 COVID-19 pandemic could not be accessed due to library closures).

The initial search identified 593 unique articles after duplicates were removed. Of those, 351 were considered relevant to the scope of this review. Documents were tagged by relevance to



one or more of the review themes<sup>1</sup>. *Annex 1* provides a list of articles that responded directly to the section on facilitators of AT provision (the main question of the review). To identify articles that may have been missed in our database searches, bibliographies of the articles included were hand-searched and added if they fit the criteria. Each article was then read in full and tagged according to themes to maintain a record of the quantity of literature within those different themes. While this thematic review has a focus on the nature, scale, quality and challenges of AT provision to children and adolescents, literature that was not focused on children was also included, because there is little child-focused literature available, and thus literature with a broader scope could still offer lessons relevant to children and adolescents.

### 3. The scope of the problem: what is known about the need for AT in humanitarian settings?

#### 3.1 Humanitarian settings in the scope of this report

Humanitarian crises tend to occur in low- and middle-income settings

UNICEF has defined a humanitarian crisis as “an event or series of events that represents a critical threat to the health, safety, security or well-being of a community or other large group of people, usually over a wide area and where affected populations cannot withstand the negative consequences by themselves” (5). Common causes of crisis include conflict, the co-location of populations with ‘natural’ hazards such as floods, earthquakes, droughts, cyclones, epidemics or pandemics, or biological or technological accidents. Crises may be sudden-onset or slow-onset, and may develop into protracted crises which improve or worsen over time (5).

An estimated 97 per cent of natural disasters happen in resource-constrained regions and, therefore, have worse and longer-term effects on their populations (6). Similarly, modern armed conflicts overwhelmingly occur in LMICs, and the burden of conflict – including mass displacement – is shouldered by other LMICs (7). In the case of this research, inferences about LMICs should note that the literature review draws significantly from studies in Nepal and Haiti, including to a lesser extent Uganda, Ethiopia, Iraq, South Sudan, Chad, Democratic Republic of Congo, Afghanistan

Category	Product examples
	<ul style="list-style-type: none"> <li>Adapted cutlery and cooking utensils, dressing stick, shower seat, toilet seat, toilet frame, feeding robot.</li> </ul>
Vision	<ul style="list-style-type: none"> <li>Eye glasses, magnifier, magnifying software for computer.</li> <li>White cane, GPS-based navigation device.</li> <li>Braille systems for reading and writing, screen reader for computer, talking book player, audio recorder and player.</li> <li>Braille chess, balls that emit sound.</li> </ul>
Hearing	<ul style="list-style-type: none"> <li>Headphone, hearing aid, amplified telephone, hearing loop.</li> </ul>
Communication	<ul style="list-style-type: none"> <li>Communication cards with text, communication board with letters, symbols or pictures.</li> <li>Electronic communication device with recorded or synthetic speech.</li> </ul>
Cognition	<ul style="list-style-type: none"> <li>Task lists, picture schedules and calendars, picture-based instructions.</li> <li>Timer, manual or automatic reminder, smartphone with adapted task lists, schedules, calendars and audio recorder.</li> <li>Adapted toys and games.</li> </ul>

FIGURE 1: EXAMPLES OF PRODUCTS RELEVANT TO DIFFERENT DOMAINS OF FUNCTIONAL IMPAIRMENT

\* These examples are meant to be illustrative only.

<sup>1</sup> These themes were 1) barriers to AT access and provision in humanitarian settings, 2) disability and AT needs data in humanitarian settings, 3) frameworks and guidance on AT provision in humanitarian settings, 4) characteristics of AT for children, 5) facilitators/what works in AT provision.

and post-earthquake Pakistan. The evidence is, therefore, weak and pertains to that of a similar subset of LMICs only. This dearth of evidence was anticipated and hence why case studies were proposed and conducted following this review.

Crises have worse and more prolonged effects in those countries where infrastructure to prepare and respond is weak (8). Limited national systems for disaster response and rehabilitation are usually overwhelmed and require multidisciplinary international humanitarian support (9)<sup>2</sup>. *Figure 1* provides examples of some common assistive products related to different types of impairment.

### Humanitarian settings have higher rates of child disability pre-crisis

It is estimated that some 80 per cent of people with disability live in LMICs (10). Disability prevalence rates are higher in LMICs for *all* age groups and across all vulnerable groups – including women, the elderly and children (11). Consequently, humanitarian emergencies disproportionately affect contexts with the highest existing prevalence of child disability, and further increase the rate of child disability by harming children who did not previously have a disability (1). In addition, humanitarian crises change the environment and make it more difficult to navigate, so children with pre-existing impairments that were not previously disabling, may find they are unable to function as before (11).



#### WHAT IS A NATURAL DISASTER?

Natural disasters are events that disrupt communities or societies, “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” (United Nations Office for Disaster Risk Reduction - UNDRR). Sudden-onset disasters can include natural events such as earthquakes or tsunamis. Slow-onset disasters include events such as droughts – such disasters are likely to be exacerbated by climate change.

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<sup>2</sup> This report is concerned with the provision of AT in humanitarian or refugee crises that require international support, and where the cluster system, refugee response or similar coordination platforms are activated or put in place. In this report AT is used as an umbrella term that includes products, devices and the systems and services that facilitate the effective provision of these products and devices and which improve the functioning of people with impairments and aim to prevent secondary health conditions.

## Crisis-related disability is increasing

The number of crises, and the number of people affected by crises, is growing (12). Those



### WHAT IS A DISABILITY?

The CRPD defines disabilities as the “long-term physical, mental, intellectual or sensory impairments which in interaction with various barriers may hinder [a person’s] full and effective participation in society on an equal basis with others” (CRPD, 2006). In line with the WHO and UNICEF, this report defines disability according to this social model. According to this model, disability is experienced when the context in which a child with physical or cognitive differences lives fails to accommodate him or her, leading to functional challenges. Not all impairments lead to a disability, and when disabling impairments are effectively responded to through AT or adaptations in the environment which alleviate functional limitations, impairments may cease to represent a disability. Based on this social model, the CRPD is a rights-based approach that emphasises disability as an “evolving concept”. As such, the CRPD emphasises the importance of tackling barriers that prevent the equal participation of people with disabilities in society, as opposed to taking a narrow medical focus on ‘treating’ impairments.

triggered by natural hazards are predicted to escalate every year, globally (1)(13). Climate change is projected to increase the number of children who will be affected by disaster (14). Children with disabilities are particularly vulnerable to the many negative consequences of climate change, which include increased likelihood of disasters (15). With medical advances, while mortality rates in disasters have decreased, the rate of survivors with disability has increased (16)(17). The **absolute** numbers injured in disasters have also increased over the past 40 years (17). Crises both directly and indirectly cause new impairments, increasing the proportion of the population likely to have a disability.

### There is insufficient evidence on the prevalence of different disabilities among children in humanitarian settings

The 2011 World Report on Disability estimated that 15 per cent of the world’s population lives with an impairment, of

whom 150 million are children. The Global Burden of Disease (GBD) is the most recent published global survey to measure child disability, finding that 93 million children between 0 and 15 (5.1 per cent of children) have a disability that is moderate to severe (18). Recent updates to the study have found that this prevalence estimate has more than doubled, likely in part due to improved modelling and data availability, as well as the inclusion of disabilities of different degrees of severity (18). Beyond global estimates of disability prevalence, there is little evidence disaggregating the relative prevalence of **different** disabilities among children.

Global Burden of Disease estimates were derived from four impairments: epilepsy, hearing impairment, visual impairment and intellectual disability (18). Using this data, a recent study estimated that globally, among these four types of disability, mild intellectual disability was most prevalent, and mild visual impairment the least (18). However, the range of disability prevalence between low and high income countries is large (19), and suggests that global estimates of different impairments (such as are available) are likely to be underestimates in countries affected by humanitarian disaster. Countries affected by disaster do not follow global or regional patterns in terms of leading causes of disability (19). The range in regional estimates of disability points to the need to develop disability screening capacity for children in humanitarian settings, and underlines a gap and need for AT (and disability) focused needs assessments and data collection tools, including in-programme monitoring. As studies analysing the GBD data point out, the estimates it provides are likely to be conservative, given

that the study is limited to only measuring four conditions, and regions with limited data (which humanitarian settings are likely to fall in) are affected by 95 per cent uncertainty intervals.

The vast majority of children experiencing visual disability live in developing countries (20)(18). Globally, approximately 1.4 million children are blind (21), and approximately 25.2 million children under five years of age have some form of visual impairment (20). Some estimates suggest that children with vision loss represent about half the population with disabilities in LMICs (22). The main cause of vision impairment is refractive aberration, which can be inexpensively treated with spectacles. Hearing loss is the second most prevalent developmental disability found in under-fives globally – again, the majority of children with hearing loss live in LMICs (20). In 2016, 15.5 million children were living with a hearing loss disability (20).

While mobility tends to be the most common form of impairment across many LMIC populations, it is unlikely to be the most common among children. A study in Uganda found that among children, hearing, vision and cognitive impairments were the three most common, with hearing impairment affecting 47 per cent of children with disability (23). However, the prevalence rates of different impairments are likely to be extremely variable, dependent on context. For example, displaced children are particularly likely to be affected by blindness as a result of vitamin A deficiency, whereas this is rarely a cause of blindness outside humanitarian contexts (21).

Communication and cognitive impairments are likely to be underestimated in crisis-affected settings. These disabilities often co-exist with other disabilities and may be a secondary disability resulting from a primary one – therefore they may go underreported if ‘bundled’ into the recording or assessment of another disability (24). Among children in particular, prevalence estimates for communicative and cognitive impairments vary considerably, even in HICs where more data is available (24). This literature review confirmed findings from previous studies regarding the paucity of literature on cognitive impairments in LMICs, and the lack of data on the prevalence of cognitive impairments (25). For example, a 2012 study found no prevalence data on autism spectrum disorder in Africa at all (26) – no later studies were identified.

## The indirect effects of humanitarian crises are likely to affect more children than the immediate disaster

Conflicts and disasters directly cause injuries that lead to disability; they also indirectly cause impairments that can lead to disability due to the negative impacts on infrastructure, healthcare services, familial support networks, hygiene and food security. Both the direct and indirect effects of crises add to the population of children with disabilities in contexts that tend to already have high rates of child disability.

The literature suggests that in at least some crises, a population with disability that survives a crisis may consist of more people with pre-existing disabilities or disabilities acquired as an *indirect* result of the crisis, than people who have directly acquired their disability from the crisis. For example, a study examining disability prevalence after Haiti’s 2010 earthquake found that the earthquake was the second leading cause of disability, with the first being communicable and non-communicable diseases (27). Studies have estimated that some 200,000 people became disabled as a result of the Haiti earthquake, compared with a population of approximately 800,000 people with disabilities pre-dating the earthquake (28). Similarly, an analysis of disability causes following Mozambique’s civil war found that, of 300 children with disabilities, only five had acquired their disability through the direct results of

war: the majority had acquired their disability indirectly or had been born with impairments due to possible maternal and child health (29) factors. Those statistics should alert humanitarian response agencies to the fact that while the most visible may be children who acquire disabilities as a direct result of a crisis, there is likely to be an even larger, overlooked population of children with pre-existing impairments and those at risk of acquiring impairments as a result of the crisis' indirect consequences.

#### Crises directly increase the number of children with impairments

As a result of the changing nature of conflict, civilians (as opposed to armed combatants) are increasingly the main casualties of war (30), and children are increasingly exposed to injury as a result of conflict (31). Use of technology such as drones can injure or kill a greater number of people more easily (36). Further, the battlefield of armed conflict is now often in urban areas which are densely populated (39). Conflict directly injures civilians, including children, who are either 'caught up in the crossfire' or directly targeted. Violent conflict sometimes deliberately targets children as, for example, in Uganda during the conflict between the Government of Uganda and the Lord's Resistance Army (32). Conflict does not only lead to physical injuries: people who experience conflict are particularly likely to be at risk of experiencing mental health related disabilities (33).

The impact of conflict on disability prevalence is difficult to predict and likely to depend on contextual factors such as the type of conflict and weapons used (34). Common forms of war trauma include bullet and blast injuries. Children with bullet and blast injuries are more likely to experience head trauma than adults (35) and are more likely to experience more severe injuries generally (31). In the International Committee of the Red Cross (ICRC)-supported hospitals, children make up over 15 per cent of the patient population, and are more likely to sustain fragment injuries, burns and mine injuries than adults, as well as being more likely to die of their injuries in hospital (36). When they sustain blast injuries, children are more likely than adults to experience blunt traumatic brain injuries and multisystem injuries.

Use of landmines, improvised explosive devices (IED), and explosive remnants of war (ERW) affects civilians during and after conflict and children are disproportionately injured as a result of landmines (37). Over a third of children who survive the detonation of landmines or explosive remnants of war require limb amputation (38).

Children are also injured in war as a result of their recruitment into armed groups. Child soldiers are a feature of several ongoing protracted conflicts, including Afghanistan, Yemen, Syria and Iraq and are more likely to be killed or injured as a result of conflict compared with adult soldiers (30).

In regards to natural disasters, like conflict, the direct effects are hard to predict because the impacts of different natural hazards vary in effects and severity. The incidence of disability caused by natural hazards varies hugely and is mitigated by context (17). The most frequent causes of disability in a natural disaster are “spinal cord injury, traumatic brain injury, fracture, limb amputation, peripheral nerve injury, and crush injury” (41). There is insufficient evidence, however, on whether children are more or less likely to sustain injuries in natural hazard emergencies than adults, and this is likely to depend on the type of disaster and the context. Some studies suggest that children may sometimes make up the largest number of patients seen by medical teams following major earthquakes (42), though this depends on context: for example, the majority of those injured in the 2005 Kashmir earthquake were young adults and adolescent girls (43)(44).

There is evidence that children have different patterns of injury than adults following a natural disaster. Following earthquakes, for example, children are more

likely than adults to have more severe injuries and open fractures, and a higher rate of femoral fractures (45), with extremities being the most common site of injury, followed by head and



#### CHILD DISABILITY DATA IN LMICs

The most recent available global dataset on disability to include data on child disability is the Global Burden of Disease, which provides data on disability prevalence for 5-14 year olds, finding that 5.1 per cent of children aged 0-14 experience “moderate or severe disability”, representing approximately 93 million children. Otherwise, there is a paucity of reliable, comparable data on children with disabilities in LMICs and even less in humanitarian contexts.

There is consensus that the available global data on child disability is both lacking and of mixed quality. Disability estimates vary because data collection and analysis methodologies, as well as definitions of disability and children, differ across studies (155)(156). As a result, it is not possible to compare rates of disability prevalence between countries using different national or independent surveys (168). The quality of data derived from national surveys in many LMICs is particularly poor. This may be due to a range of factors, including: 1) the use of narrower, medical definitions of disability by both respondents and survey enumerators; 2) social stigma limiting or stopping respondents from disclosing disability; and 3) challenges of including hard-to-reach populations in surveys, including the most vulnerable and those in institutions. Measuring child disability may also be challenging in all contexts because of the difficulty in distinguishing between functional limitations and differences in child development.

The Washington Group on Disability Statistics was established in 2001, to develop a consistent approach to gathering reliable data on the level of functioning in a population. The Washington Group, in collaboration with UNICEF, produced a Child Functioning Module in 2016. This covers children aged 2–17 years and assesses functional difficulties in different domains. Use of the Washington Group questions is considered best practice in gathering disability data and has been incorporated into UNICEF Multiple Indicator Cluster Surveys. In time, systematic use of the Washington Group Child Functioning module should elicit more and better data on children’s functional impairments in humanitarian settings, and more comparable estimates of disability prevalence (27). This data could allow researchers (and humanitarian response agencies) to compare changing participation levels for people with disabilities over time and measure the impact of interventions for people with disabilities (155)(156), in order to monitor progress against the objectives of the CRPD (170). It should be noted, however, that the Washington Group questions are not a diagnostic tool: they merely assess the prevalence of functional difficulties in a population.

spinal injury (46). As paediatric patients present with different injuries, they also have very different care needs to adults, and it is important that response agencies are familiar with those differences (42).

### Crises indirectly increase the number of children with disabilities

It is likely that in most humanitarian settings, the biggest driver of increased rates of acquired disability among children in the long-term is not direct injury, but rather the harmful effects of disaster on the context in which children live. Children are more vulnerable than adults to these indirect effects of crisis, due to their weaker immune systems, broader physiological differences and reliance on others to meet their basic needs (47).

Poor and reduced access to health services as a result of disaster can increase the incidence of disabilities caused by preventable diseases. Poor quality emergency care after a crisis, or emergency care conducted in extreme conditions, increases the severity of impairments and increases the need for AT and rehabilitation services. For example, following the 2008 Haiti earthquake many amputations were carried out under difficult conditions due to the initial collapse of the hospital system. This is in contrast to contexts like the 2005 Kashmir and 2008 Sichuan earthquakes, where decisions on amputations could be delayed (48), leading to fewer long-term and severe rehabilitation needs. A lack of rehabilitation services has also been identified as a reason for worsened outcomes and secondary complications for those who sustain serious injuries in disasters (48).

Children in conflict-affected countries are significantly less likely to receive crucial vaccinations than children in LMICs (49), leading to an increase in preventable diseases which cause disability, such as polio (50)(49)(51)(52). Children are also particularly vulnerable to the harmful effects of worsened healthcare (53). For example, after the 2015 Nepal earthquake, there were reports that children commonly faced “diarrhoea, upper respiratory tract infections, fever, nausea, rashes, loss of appetite and premature delivery” (53). Exposure to disease and reduced access to vaccinations and other basic healthcare can increase all children’s chances of acquiring additional co-morbidities, but this is particularly so for children with disabilities (6)(17). Crises can also lead to food insecurity, which has long-term and intergenerational health effects – effects that may result in greater challenges for children to cope



#### DISPLACED CHILDREN WITH DISABILITIES

Crises may lead to displacement either outside or within a country where the crisis has taken place. Children with and without disabilities are particularly vulnerable to the risks associated with living as a refugee or internally displaced person. These risks include inability or limited access to health services, which can lead to children acquiring an impairment or co-morbidity. Displaced children with disabilities have a high risk of neglect and abuse (128). A study examining the experiences of displaced people with disabilities in five countries (Nepal, Thailand, Yemen, Ecuador and Jordan) found that while some mainstream support for displaced people with disabilities existed in all settings, very few specialised services – including specialised healthcare services – were available. This study also reported a lack of referral to external specialised services for people with disabilities, outside of camp settings (128). One literature review suggests there is a disproportionately larger amount of evidence on refugees with disabilities, particularly in camp settings (29). However, there is anecdotal evidence that aid agencies may feel hesitant about providing very well-resourced or specialist provision for children with disabilities knowing that such provision cannot be sustained outside the camp settings (29), and may foster resentment among the host community. Nevertheless, camps may represent a good opportunity to innovate for the provision of people with disabilities because they are a relatively more controlled and well-resourced environment, compared with the environment outside a camp (29)(55).

with disabling injuries or other effects of conflict (54).

Humanitarian crises often lead to mass displacement (outside or within a country), which increases the number of children living in precarious and unsanitary conditions. Displacement pushes children into poverty, further frustrating their access to crucial services – potentially including health services – leading to increased risk of disabling injury or disease (48).

Displacement is currently at a record high, with 68.5 million people living as refugees, asylum seekers or internally displaced persons, of which 28 million are children (35). LMICs host four fifths of the world's refugee population (55). We can infer that displaced children are vulnerable to acquiring a disabling disease, trauma, injury or other harm as a result of crisis.

Both conflict and natural disasters increase children's vulnerability to abuse, exploitation and sexual violence (56)(8), which can lead to disabling injury or harm. Children experience vulnerability to different types of abuse dependent on their sex: girls are more likely to experience sexual abuse, and boys are more likely to experience violence or recruitment into conflict.

### **Children are particularly vulnerable to crisis effects**

There are six determining factors that make children vulnerable to harm in humanitarian settings and where having an impairment further compounds the risk of harm:

#### **a) Poverty**

Children with disability are more likely to live in poverty. Poor children are more likely to live in poor-quality accommodation which is more likely to suffer greater damage in a disaster, increasing the risk of harm (57). Poor children are also less likely to have families who can afford to take preparedness actions, or evacuate dangerous settings, leaving them at greater risk of disabling injury (57).

#### **b) Functional impairments that limit protective action**

Children with and without physical or cognitive impairments are often less able to take mitigating actions, follow or understand instructions and warnings, and physically escape dangerous situations (57). Children have anatomical and physiological differences from adults that may make them more susceptible to injury in a disaster, and therefore more likely to acquire an impairment. For example, children have larger heads in relation to their bodies, proportionately larger organs which are less protected due to under-developed ribs (58)(59).

#### **c) Barriers to evacuation**

Evidence shows that households with at least one disabled member were between 9 and 25 per cent less likely to evacuate, often reporting that this is because of difficulties accessing transport and accommodation due to their particular needs (57). This affects both children who have an existing disability and those who acquire a disability in conflict.

#### **d) Exclusion from emergency planning**

Disaster response organizations and personnel often fail to include the most vulnerable and marginalized groups in their preparedness and response planning (57). Children who had a disability prior to a disaster may be deprioritized in favour of those who acquired a disabling injury during(60), leaving many children with disabilities particularly vulnerable and with unmet assistance needs. Humanitarian Needs Overviews (HNOs) and Humanitarian Response Plans (HRPs) are increasingly more inclusive, possibly due to a growing availability of guidance on broad disability inclusion. However, specific humanitarian guidance on AT provision is lacking by comparison.



e) Separation from caregivers

Children with or without disabilities are more vulnerable to harm when they are separated from their caregivers, a risk which increases drastically in emergencies (29).

f) Stigma

In some settings, the discrimination and social exclusion that people with disabilities face, coupled with the vulnerability and reliance of children on others for help, means that children with disabilities can be deliberately excluded from help or abandoned during evacuation (60).

## Rates of unmet need for AT in humanitarian settings are likely to be very high

Humanitarian settings are likely to be LMICs, where estimates suggest only 5 to 15 per cent of people with disabilities can access appropriate AT (2). The WHO has estimated that, globally, 1 billion people who need AT do not have access to it, and that this could double by 2050 (61). Children with pre-existing disabilities in humanitarian settings are therefore likely to have never had access to the AT they need, prior to a crisis. Some AT products are less available than others: for example, in 2011 the WHO estimated that only 0.5 per cent of those who need a prosthetic or orthotic device in developing countries received one and globally 3 per cent of those with rehabilitation needs had them met in (62).

## Which children need AT in a humanitarian crisis?

Humanitarian settings are likely to have a particularly high pre-existing child disability prevalence rate, and this rate is likely to increase as a result of children newly acquiring a disability or losing their assistive device as a direct or indirect consequence of disaster.

The perceived *urgent* AT need post disaster is typically for children who have acquired an injury as a direct result of the crisis. For example, following the 2005 Kashmir earthquake, 40 per cent of seriously injured victims of the crisis were identified as needing rehabilitation and AT products (44). Based on the academic literature, the AT supply, where it exists in a humanitarian setting, is focused on meeting the needs of those who acquired their disability as a direct result of the disaster, and particularly those who were treated by first-responder emergency medical teams.

In at least some humanitarian contexts, the largest proportion of children with AT needs may in fact be children with pre-existing disabilities. These children's AT needs may have been overlooked and remain unmet due to an overall lack of awareness of AT availability amongst humanitarian service providers, as well as amongst children with disabilities and their caregivers'. The most visible demand for AT from



### THREE GROUPS OF CHILDREN WHOSE AT NEEDS REQUIRE RESPONSE IN A HUMANITARIAN CRISIS

- Children who *newly acquire* a disability as a result of the direct or indirect effects of a crisis, and children with pre-existing disabilities who acquire a secondary disability or co-morbidity as a result of a crisis;
- Children with pre-existing disabilities who *lose their required assistive device* in the crisis (29)(63)(83)(12);
- Children with pre-existing disabilities who *never had access to a required assistive device*, and may have never been identified as having a disability.

children with pre-existing impairments are from those who had previous access to AT products that were damaged or lost in the disaster (63).

AT supply and demand may have little or no relationship to the level of AT need in a humanitarian setting. As discussed in Section 4, this is because there are other drivers of demand and supply – for example, the cost and availability of different products in the local market, the level of product awareness among potential beneficiary populations, or disproportionate donor and media attention to particular AT needs.

### The evidence is insufficient on the need for different types of AT

There is limited evidence on the need for or availability of different types of AT products (64–66). For example, few LMICs have data on the unmet need for visual aids compared with hearing aids.

The number of children with an impairment or a disability does not directly translate to the number of children who need AT. Not all children with impairments have a disability, and not every child with a disability would benefit from an AT product. For example, estimates based on studies in high-income countries suggest that only 20 per cent of those with hearing impairments require hearing aids (11). Conversely, many who use assistive devices may not identify as having a disability, and in some cases this may be because the assistive device successfully mitigates their functional impairment (65).

## AT needs assessments in humanitarian settings are at a nascent stage

There is limited documentation of systematic AT needs assessments taking place in humanitarian settings, despite them being highlighted as a requirement or best practice in several agencies' guidance documents. However, there is evidence in the grey literature (i.e. in reports absent from indexed databases) that some form of needs assessment has been conducted in certain settings: for example an AT needs assessment was conducted among Syrian refugees in Jordan and Lebanon by Humanity and Inclusion in 2018 (67).

WHO has developed Assistive Technology Assessment tools (ATA) to assess the AT landscape in any given setting, including humanitarian, at household level. Those tools include a survey to assess the self-reported needs and unmet needs for AT in a particular setting (ATA-N) including a rapid 'r' version (rATA); and a survey to assess the AT *system* (ATA-S)(68). Those tools have not been extensively trialled in humanitarian settings, and they do have limitations, for example, self-reporting may not provide an accurate picture of actual need (65). However, if more widely used, the ATA tools many provide a useful snapshot of patterns of AT access in low-resource settings, reducing a large evidence gap.

By focusing on functional impairments rather than disability prevalence, the ATA-N may provide evidence on the necessary AT priorities to accountable crisis-response agencies. The ATA-N survey reveals beneficiaries' priorities, which may not obviously relate to their impairment. For example, when people have mobility needs, the technologies they prioritize may not be related to alleviating all mobility limitations, but are often simple products that allow for self-care or dignity, for example special toilets (69).

## Access to appropriate AT is particularly important for children

Of the limited available literature on the needs of people with disabilities in humanitarian settings, the majority focuses on adults and the elderly, among whom the incidence of disability is higher. However, there is evidence that children are likely to have different AT needs than adults, and that appropriate AT provision is particularly important for children (65).

Failure to provide children with AT, particularly in a crisis, has grave consequences. Children who cannot access the AT they need experience a larger impact on their life (70), and are more likely to acquire a secondary disability (71). In other words, children with disabilities who are



### ASSISTIVE TECHNOLOGY AND ASSISTIVE

#### PRODUCTS

The GATE initiative by WHO defines 'assistive technology' broadly, to encompass the application of systems, services and products that enhance the functioning of people with impairments. GATE defines assistive products as "any product (including devices, equipment, instruments, and software), either specially designed and produced or generally available, whose primary purpose is to maintain or improve an individual's functioning and independence and thereby promote their wellbeing" (147). Assistive technologies allow people with disabilities to realise their human rights (2). Assistive technologies are considered a crucial mediator to meeting the Sustainable Development Goals (171).

GATE has published a Priority Assistive Products list of 50 products, aimed at improving functioning for people with mobility, cognitive, communicative, hearing and visual impairments. These range from wheelchairs and hearing aids to pill organisers and pressure relief cushions. WHO is currently developing an adapted priority assistive products list specifically for humanitarian crises.

not supported with appropriate AT are more likely to become adults with more limiting disabilities, and who have experienced disability for a greater proportion of their lives.

Studies consistently find that lack of access to AT is one of the key barriers to children with disabilities attending school (3). AT access, for example, is linked to increased school attendance – and certain assistive products, such as hearing aids and glasses, may have a beneficial impact on learning outcomes (72)(73). When appropriate forms of AT are provided, including appropriate fitting and training in their use, AT can reduce children’s experience of disability, prevent further disability, reduce poverty, increase independence, promote early childhood development and help the child meet their full potential in society (65)(4). The positive impact of appropriate AT is likely to be even greater on the life of a child in a humanitarian setting, as children in these settings are particularly vulnerable to harm.

### Children have different AT needs from adults in humanitarian settings

There are particular challenges and considerations related to AT provision for children in comparison to adults. Children are not simply small adults. Children’s unique AT needs are driven by three factors: 1) children have growing bodies; 2) children are physiologically different to adults; 3) children have different functional needs to adults. To this it should be added that children – and particularly children experiencing disability in a crisis setting – may have different and additional *psychological* needs associated with their disability which may impact on the appropriate choice of AT, and how it is provided.

For almost all mobility, visual and hearing devices, children’s ability to make use of the device is dependent on it being the correct size (71). Appropriate selection and provision of AT for children is crucial because, if children receive a device that does not meet their needs, this can lead to secondary impairments and the chance of abandoning the device is high.

## 3.2 What are the evidence gaps relating to AT need?

- **Evidence regarding the prevalence of functional limitations** among children in LMICs and humanitarian settings. UNICEF’s Multiple Indicator Cluster Surveys (MICS), which use the Washington Group tools, may fill this gap; however at present there is little comparable data from LMICs or humanitarian settings using Washington Group questions on children’s functional limitations.
- Data on the **relationships between children’s functional impairments and needs** in humanitarian settings. Based on an understanding of the prevalence of functional limitations in a population, estimates could be made of the likely level of need, which would be helpful to provision planning. This type of estimation could provide humanitarian response agencies with ‘good enough’ estimates of required AT in the aftermath of a sudden-onset disaster.
- **Best practice in data collection on needs and unmet needs** among children in humanitarian settings. ATA-N is being piloted in LMICs and could be piloted in humanitarian settings in future. Piloting should be used to build the evidence base on best practice in achieving an accurate estimate of AT needs among children, for whom the challenges of data collection are likely to be higher.
- **Adolescent-specific AT needs.** The academic literature does not distinguish between child and adolescent disabilities, needs and unmet needs. UNICEF’s 2011 State of the

World's Children report states that the number of adolescents with an impairment or disability is unknown (74).

- **Child-specific AT needs** in humanitarian settings. There is no evidence comparing children's AT needs adults' AT needs in humanitarian settings, in terms of the types of AT needed and the relative quantity of AT needed.

## 4. The state of play: what is known about AT provision for children in humanitarian settings?

### 4.1 Frameworks and guidance governing AT provision in humanitarian action

There are several legal frameworks and guidelines on the rights of people with disabilities to access AT, and the responsibilities of actors involved in humanitarian action to ensure AT is accessible to those who need it. Some of the key frameworks are identified below, however this is not a comprehensive list. It should be noted that guidance documents usually only clarify the AT responsibilities of the author agency, and there is no single framework that describes models for coordinating responsibilities (e.g. within the Inter-Agency Standing Committee (IASC) cluster system) among the different agencies usually involved in a humanitarian response. Only the relevant AT-related guidance has been extracted from the documents below.

#### [Convention on the Rights of Persons with Disabilities \(CRPD\)](#)

The United Nations Convention on the Rights of Persons with Disabilities (CRPD) entered into force in 2008. The CRPD details how States Parties should realize the rights of people with disabilities. To comply with the CRPD, States Parties must ensure that AT is equitably provided to all who require it (4). The CRPD takes a rights-based approach: governments do not provide AT as an act of charity, but rather because it is a basic human right to live with dignity and participate in society on an equal footing with others (75).

Given that in most LMICs, AT is currently neither available nor affordable, the CRPD puts considerable responsibility on both national governments and the international community to make AT available to everyone who needs it (4). In a humanitarian crisis, the agencies accountable for the humanitarian response – including national government and UN agencies – have a duty to work together to comply with CRPD requirements.

#### [WHO Resolution Improving Access to AT \(2018\)](#)

The 2018 resolution urges member states to improve access to AT, including:

- collecting population-based data on met and unmet AT needs;
- developing and implementing policies and programmes to improve AT access within universal health coverage; and
- ensuring adequate personnel for AT provision and maintenance.

#### [IASC Guidelines on inclusion of persons with disability in humanitarian action \(2019\)](#)

The IASC guidelines describe key actions required at the preparedness, response and recovery stages of a crisis:

- Mapping local disabled persons organizations (DPO) and AT supplier information
- Use of the Washington Group questions to gather and disaggregate disability data
- AT needs assessment and monitoring
- Ensuring contingency plans and acquiring assistive products to replace those that are likely to have been lost or damaged
- Provision of affordable, locally appropriate, sustainable or free AT
- AT responsibilities as part of health, education, livelihoods and WASH clusters.

### WHO Minimum standards for rehabilitation in emergency (2016)

WHO technical standards govern the approach of EMTs in emergencies. The guidance related to AT states that EMTs should not expect equipment to be provided by the host country or another EMT, and that rehabilitation materials should be selected according to anticipated needs, capacity, local needs and expected case load. Wheelchairs, orthotics and prosthetics should be obtained from a local supplier where one is available, otherwise the EMT should seek guidance from the host Ministry of Health or health coordination body.

### Guidance on including children with disabilities in humanitarian action (2017)

The UN guidelines describe key actions required at the preparedness, response and recovery stages of a crisis.

#### Preparedness:

- Without pre-existing data on children and adults with disabilities, estimate that 3 per cent of the population needs AT
- Identifying children with disabilities and their needs using Washington Group questions
- Mapping existing AT programmes, services and suppliers
- Identifying targeted supplies, including AT, to respond to children's disability-related needs
- Sharing information with humanitarian partners on AT suppliers, stocks and supply chains.

#### Response:

- Water, sanitation and hygiene (WASH), education, nutrition, child protection and health clusters to take responsibility for provision of their respective specialist AT, with collaboration of host government
- Dedicated AT budgets in programmes
- Consider cash transfers to allow vulnerable households to access AT
- Establish referral systems with providers of AT services.

#### Reconstruction:

- Establish long-term agreements with AT suppliers/encourage bulk procurement; mainstream procurement of AT within other services
- Identify government agencies/ministries with responsibilities for AT initiated during the response phase, that could be expanded/strengthened in recovery planning
- Encourage development of national Priority Assistive Products list.

## 4.2 What do we know about AT provision in current and historical crises?

Interventions to improve AT access as part of a humanitarian response may involve:

- agencies providing AT to target populations (i.e., providing assistive products or services that did not previously exist in the setting); or,
- agencies facilitating access to AT to target populations (i.e., alleviating barriers to accessing AT that already exist in the setting, e.g., through cash transfers, information or transport to services).

There is very limited available evidence providing examples of AT provision in humanitarian crises. This is perhaps predictable, given the paucity of evidence regarding effective modalities of provision even in LMICs (66).

## The IASC Cluster system

A Cluster response is typically activated in the event of a non-refugee humanitarian crisis that exceeds the capacity of the national government to respond. The Cluster approach is used as a response to both sudden-onset and protracted crises, and when the crisis is caused by conflict or 'natural' disaster. Individual Clusters are led by IASC-designated United Nations agencies and co-led with government, with agencies taking responsibility as Providers of Last Resort. All clusters are collectively led by a Humanitarian Coordinator, in partnership with the national government.

Each Cluster represents one sector of the necessary humanitarian response, based on need (e.g., health, education, WASH) with the aim of the Cluster system to coordinate humanitarian response. AT provision may in some circumstances sit under the health Cluster, but AT provision is frequently treated as a 'cross-cutting' issue for which multiple Clusters have some responsibility. For example, the education Cluster may have responsibility for conducting school-based child AT needs assessments and overall provision of AT would require a coordinated cross-sectoral programming approach.

The Cluster response is directed by a HRP, which articulates a shared vision for the resources and intervention priorities necessitated in the response, with overall coordination from the United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA) and a designated Humanitarian Coordinator. The HRP is informed by a Humanitarian Needs Overview (HNO), which assesses the needs of the context. This literature review found reference to provision of AT in only three 2020 HRPs: Iraq (76), Afghanistan (77) and Ukraine (78). In all three examples, provision was detailed under health Cluster responsibilities. As part of the Iraq 2020 HRP, planned AT provision is limited to amputees. As part of the Afghanistan 2020 HRP, AT provision appears to be restricted to 'post-trauma' situations, suggesting that only those who have acquired a disability as a direct result of the conflict are targeted by the AT-related response. As part of the Ukraine 2020 HRP, AT provision is restricted to older adults, and this directly follows from the supporting evidence in the HNO that highlights the high barriers to AT access experienced by the elderly.

Some guidance documents on how AT provision should be managed in a crisis articulate how AT provision should be facilitated at preparedness, response and rehabilitation stages of the crisis (e.g., (79)(80)). However, in practice, if AT provision is not included in a HRP, it is unlikely to be part of the crisis response. If AT needs are not considered in the HNO, they are unlikely to be included in the HRP.

In a similar way to the IASC humanitarian Cluster system, a Refugee Coordination Model (RCM) may be activated when a refugee crisis exceeds the capacity of a national government to fully respond to refugees' needs. As in a humanitarian crisis, the state is responsible, but may be constrained in its ability to meet its responsibilities due to the scale of a refugee crisis putting strain on already overburdened state infrastructure. In such cases, the UNHCR is responsible for coordinating the refugee response in support of the national government. A Refugee Response Plan (RRP) articulates the nature of the refugee crisis response.

## Before the crisis: AT in preparedness planning

There are examples of disaster preparedness/mass casualty management plans that include stockpiling of assistive devices and rehabilitation supplies. This approach was taken in Nepal in advance of the 2015 earthquake (81), where NGOs were able to distribute mobility aids that were held in reserve with relative efficiency. Distribution was likely affected by practical considerations (limited resources and geographical challenges) which may have made



distribution of assistive devices inequitable: as a result it is unclear to what extent this approach met the needs of people with disabilities (1). Similarly, a WHO report on the Philippines' disaster preparedness in the aftermath of Typhoon Haiyan implies that stockpiles were available, though the report suggests they were not sufficient to meet the AT needs of the population (63).

### Acute stage: more is known about EMT-delivered devices in acute stage of response

In a sudden-onset disaster, though there may be initial damage to services to the point they may cease to operate, pre-existing health services often resume within weeks. These services may be led by local and/or international teams, and may often involve the establishment of temporary field hospitals (e.g., (82)(83)).

The academic literature suggests that rehabilitation services are lacking in humanitarian crises (17)(84). In LMICs in general there is also often a perceived lack of rehabilitation expertise (17)(85), though this may be different in specific humanitarian settings. If rehabilitation services exist, they tend to be quickly overwhelmed, small-scale and localized, or provided by foreign teams linked with emergency medical services and focused on the acute stage of crisis. After the 2010 earthquake in Haiti, for example, foreign accredited professionals working for international NGOs "supervised locally trained Haitian P&O [prosthetic and orthotic] technicians, physical therapists and rehabilitation technicians" (86). One paper reports that Humanity and Inclusion commenced needs assessments 'within days' of the disaster, which informed the provision of prosthetics and orthotics (86). Similarly, following natural disasters in Iran (87) and in Kashmir (44)(43), NGOs and government systems collaborated to deliver hospital-based services.

There is also evidence of other approaches. For example, following Typhoon Haiyan in the Philippines, community-based rehabilitation approaches were used through a partnership between government, local and international experts, and a needs-assessment was conducted by NGOs and experts with WHO support (83).

The literature suggests that there have been examples of effective and well-coordinated AT provision to those who sustained disabling injuries as a direct result of a crisis, as part of EMT response (e.g., in Nepal (1), Haiti (88) and the Philippines (86)(83)). However, there is little analysis of the factors that made AT provision effective in those crises, and there is no evidence of AT provision to the wider population of people with disabilities, including those with pre-existing disabilities. There is very limited literature available on which agencies provide AT in humanitarian settings and the type of care they provide, and of the available literature, much is anecdotal (89). As most of the available literature on AT provision in humanitarian settings relates to programmes associated with EMT-delivered, post-surgery interventions, most of the available literature has a narrow focus on mobility impairments.

The paucity of research evidence of rehabilitation support following many crises is perhaps unsurprising considering that there is likely to be very little or low-quality medical support of *any* kind for people with disabilities in many crises, and particularly in conflict settings. For example, a study examining the experiences of the war-wounded in Uganda found that the majority had not received any state-provided treatment, and those who had been able to access some form of treatment had accessed pain medication (as opposed to assistive technology or rehabilitation services). This study found that Uganda's post-conflict recovery policies did not include any interventions aimed at meeting the needs of those with disabilities resulting from the conflict (32).

## Post-acute stage: little is known about provision of assistive devices in later stages of response

There is very little literature on whether and what AT provision emerges in the post-acute stage of a crisis, beyond EMT-managed AT. This review also found no high-quality impact evaluations of the kinds of NGO-led AT interventions that were found in the grey literature.

Six examples of AT provision were found in the post-acute stage of a crisis, of which all but one was from the 2010 Haiti earthquake. These were:

- A paper assessing the success of a wheelchair donation programme in Haiti, which identified concerns related to AT provision through foreign NGOs (90).
- A paper on AT provision following the 2008 Sichuan earthquake, which combined institutional and community-based approaches (91).
- Three papers describing the limitations of AT provision in Haiti led by NGOs (92)(93)(94).
- A paper outlining the long-term impact of investment in rehabilitation services following the 2010 earthquake in Haiti, pointing to training of personnel, community-based rehabilitation approaches and accreditation schemes to strengthen and expand provision (86).

The grey literature points to more examples of specialist NGO provision of AT programmes in crises, though no publicly available evaluations of these interventions were found, and there was limited discussion of these interventions in the academic literature. For example, a report of CBM activities one year on from the 2015 earthquake in Nepal describes a number of different AT interventions, including:

- Supporting a partner (hospital and rehabilitation centre for disabled children) to set up camps for rapid needs assessments of rehabilitation requirements, followed by referral and AT provision;
- Partnership with the Leprosy Mission Nepal to establish hospital outreach camps for disability screening, referral and AT provision;
- Partnership with International Nepal Fellowship to establish a rehabilitation centre outreach camp to provide holistic rehabilitation services including AT;
- Conducting aging and disability focal points in three districts to gather data on the needs of people with disabilities, and coordinate with larger humanitarian organizations and mainstream disability inclusion in humanitarian provision. The focal points also provided AT products.

Another example in the grey literature is described by a World Confederation of Physical Therapy report. Following 2013 Typhoon Haiyan in the Philippines, a group of local physical therapists lobbied the international agency that planned to distribute wheelchairs to lead this task. These local therapists conducted a needs assessment for each client, then purchased appropriate wheelchairs from a local manufacturer. Fifty people were provided with a wheelchair. A key lesson learnt was the value of international organizations partnering and supporting local experts where available (12).

NGOs such as Humanity & Inclusion and CBM report a 'twin track' approach: both focusing on the specialist needs of people with disabilities (such as AT) and advocating for and facilitating the inclusion of people with disabilities in humanitarian relief. The search stage of this review found that much of the academic and agency discourse regarding people with disabilities in crises is centred on the latter 'track' of the twin-track approach: i.e. ensuring that humanitarian

response is *inclusive* of people with disabilities (64,95). The lack of literature on AT support sits within the context of a lack of literature on any provision of specific services for people with disabilities.

There is some evidence from the grey literature of crises where attempts have been made to monitor the full range of AT provision and access barriers by multiple providers, and that there was some kind of coordination of provision beyond the acute phase of the crisis. For example, in Jordan there is a disability taskforce that provides some form of coordination and information-sharing regarding services for people (including children) with disabilities, including AT provision. A Humanity & Inclusion survey found that in Jordan's Za'atari refugee camp, a third of respondents to a household survey reported not having access to the assistive devices they needed.

The top reported barrier to AT access among Syrian refugees in Za'atari is transport and cost, suggesting that some AT services required by refugees exist outside camps. The fact that two thirds of respondents *did* have access to their required AT, suggests some form of AT provision was taking place and was accessible. However, it should be noted that Jordan is an unusually high-income setting for a humanitarian crisis, with capacity for AT provision pre-dating the refugee crisis and, therefore, likely not to be representative of most humanitarian settings. It is also unknown whether any AT provision in Jordan is targeted at refugees, and whether humanitarian agencies have any role in making AT products and services more accessible to the refugee population. There is no academic literature of the nature of AT coordination and AT provision for refugees in Jordan (if such systematic coordination/provision exists).

There is no published evidence found to-date on how assistive technologies are provided to children who lost their devices in the disaster, or to those who never had a required assistive device in the first place. This is likely due to the existence of very few examples of such provision, beyond small-scale provision by specialist NGOs (69). A United Nations Development Programme (UNDP) report on the experiences of people with disabilities in Nepal after the 2015 earthquake found very few programmes aimed at meeting the needs of people with disabilities, let alone programmes to provide assistive products. The few that did exist were standalone (as opposed to coordinated or integrated into systematic provision) and had very limited coverage, confined to a minority of the population with disabilities (96).

There is historical evidence that in some crisis-affected countries, AT services may be restricted to particular groups after a crisis (rather than all those in need): most commonly these will be veterans of war. For example, in Turkey the armed forces rehabilitation centre provided prosthetic limbs for veterans of war at no charge to the recipient. The prosthetics were very basic, and subsequently, as expected in any scenario, following the later availability of more sophisticated prosthetics, veterans increasingly purchased replacement prosthetics on the private market (97). Similarly, in Ukraine, prioritised assistance is offered to people with disabilities who sustained their impairment in conflict (98); even those with conflict-related disabilities often experience difficulty in proving their disability status and in receiving the correct certification (98). This suggests that, even in higher-income countries, there are challenges associated with providing quality AT or rehabilitation services affordably to even a small proportion of the population with AT needs.

## Rehabilitation stage: disasters can prompt improved AT services

The literature includes some examples of where a sudden-onset disaster prompted the government in a low-income setting to initiate new or additional rehabilitation services

(including AT services), which were then sustained beyond the aftermath of the crisis, leading to improved rehabilitation systems. In the Philippines post Typhoon Haiyan, for example, rehabilitation services became a priority for both the government and hospitals, as a result of the increase in people with rehabilitation needs. The increase in rehabilitation needs came from those who were both newly injured in the disaster, and those with pre-existing impairments whose situation had worsened (83). The increase in the supply of services led to increased demand for AT products which led to the establishment of a workshop for the manufacture of prostheses and orthoses (83). Local offices for international organizations, such as WHO, also contributed to this prioritization by increasing the procurement of rehabilitation equipment. This led to a threefold increase in the number of patients receiving rehabilitation a year after the disaster, and improved and increased rehabilitation services in comparison to before the disaster.

While this improvement may in part be reflective of an increase in need, it also demonstrates the possibility for significantly increasing a country's rehabilitation and AT provision capacity. This affords the opportunity to 'build back better' as a result of a sudden-onset crisis – and to build public and state awareness of the needs of people with disabilities – as has been noted in several other settings affected by major crisis, particularly natural disaster (e.g., (86)(91)(28)).

#### 4.3 What are the evidence gaps relating to the current provision of AT in humanitarian settings?

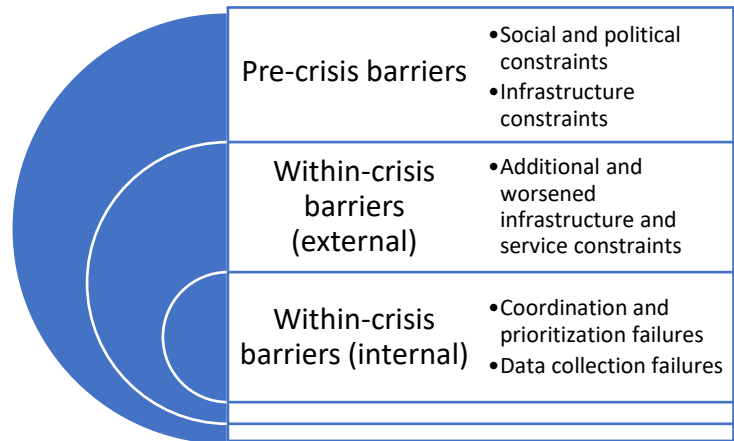
This English-language-based literature review points to a grave lack of evidence describing and evaluating AT provision in humanitarian settings. This does not necessarily point to a lack of interventions, as the paucity of literature may be the result of a lack of academic attention to the topic. However, the lack of evidence certainly makes it very difficult for organizations with a role in AT provision to make evidence-based decisions on their choice of models for provision of AT. As such, evidence is urgently needed on the following themes:

- Evidence of **what drives/incentivizes inclusion of AT programming in HRPs**, in those cases where AT is included in HRPs.
- Evidence on the **nature and scale of AT provision** in humanitarian settings, particularly beyond the acute stage of the crisis, and particularly for children with pre-existing disabilities.
- Evidence of the **comparative effectiveness of models of AT provision** in humanitarian settings where it exists, and on outcomes more broadly.
- Evidence of the **comparative effectiveness of models of AT coordination** in humanitarian crisis, where it exists.

## 5. Barriers to AT provision and access

In countries where an international humanitarian response is necessitated by crisis, the pre-existing context is already likely to be ripe with challenges for AT provision. On top of those, the crisis itself is likely to introduce new barriers and constraints to provision. Then the humanitarian response itself is likely to yield its own barriers to AT provision. These can often be in the form of response agencies experiencing disincentives to prioritize the AT needs of children with disabilities, though that is now changing for the better; and/or the special characteristics of AT products, which may make them harder for humanitarian actors to procure and distribute compared with other humanitarian products and services.

FIGURE 2: BARRIERS TO AT PROVISION AND ACCESS IN HUMANITARIAN CONTEXT



### 5.1 Pre-crisis barriers

#### Access to AT is constrained by geography

In LMICs, many children with disabilities live in remote, rural areas without rehabilitation or AT services, and have to travel long distances to access them (72)(99)(87). Transport is often not available or costs too much for people with disabilities and their families (100). In a conflict-affected context, it may also be dangerous to travel to seek healthcare (101). Children and adolescents with disabilities are particularly reliant on family members to access AT and other healthcare services, and in an emergency those family members may have been killed or injured and unable to help or prioritize children’s AT needs (86)(102)(70)(74). Grey literature suggests that people in camps with AT needs also cite transport costs as a barrier, suggesting that specialist AT is sometimes only available outside camps (103)(67).

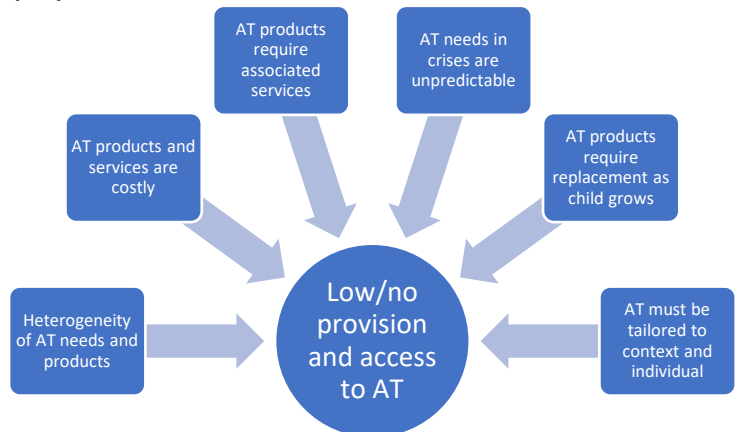


FIGURE 3: BARRIERS TO PROVISION RELATED TO AT AS A CATEGORY OF HUMANITARIAN PRODUCTS/SERVICES

## Lack of pre-existing health infrastructure

Rehabilitation services – of which provision of AT is a key part – are often not a government priority in low-resource settings (e.g., (104)(105)(87)(106)). In these settings rehabilitation services – if they exist at all – have very limited capacity (107)(102)(70) with insufficient and under-trained personnel (70)(96)(86) (85), and are located in major cities away from where the majority of children with disabilities may tend to live (83)(92)(108). Hospitals in crisis-affected settings are also unlikely to have existing experience in paediatric care (109) or have paediatric-specific medical supplies (88). Lack of healthcare financing is likely to limit access to AT, or may restrict AT access to low-technology AT products (110).

In humanitarian settings, stockpiles of assistive products are unlikely to be available nationally or even regionally as part of disaster preparedness planning. For example, in a study looking at disaster preparedness in the Philippines, inventories suggested that available stockpiles were not sufficient to meet the needs that would result from a disaster (63). In LMICs, stockpiles are likely to be far lower, or more likely non-existent. Following the 2015 earthquake in Nepal, HI established depots stocked with assistive devices, but allocating and deploying them is still recognized as a challenge, given the infrastructure destruction that is likely to follow future crises (96).

## Lack of data

In humanitarian settings, there is usually very little data available on disability prevalence, either before, during or after the crisis (99) (and for example, (96)(70)).

## Provision of AT is constrained by the attitudes of those in government

There is some evidence that the failure to prioritize rehabilitation for people with disabilities is in part the result of discriminatory attitudes to disability from government workers and service providers (64).

## Provision of AT is constrained by limited or no AT market

Most LMICs have a very limited national AT industry. For example, before the 2010 earthquake, Haiti had little capacity to manufacture assistive products, and after the disaster did not even have enough basic, lower-cost assistive products, such as crutches or [white] canes available to meet needs (70). The products needed in crisis must be low cost, low tech and environmentally appropriate to deal with uneven ground or other features of the natural environment which children with disabilities must navigate. Where they are available, local products tend to be of poor quality, and not appropriate to the person in need (64). There is very little research and development on appropriate products for use in humanitarian settings or LMICs in general (111)(106). In some cases where LMICs have an AT manufacturing or production industry, it tends to be for export to HICs. As a result, the products manufactured will be designed for HICs (112).

Where there is no local AT market, families must source foreign-made products. The families of children who have experienced disaster are highly unlikely to be able to purchase such products, due to the prohibitively high cost.

## Access to AT is constrained by stigma

Children with disabilities are among the most stigmatized and excluded populations in the world. In many humanitarian settings, people with disabilities face the perception that they are 'worthless' members of society without the ability to contribute (86). This exclusion makes it less likely that children with disabilities will be able to access services in a humanitarian crisis. For example, children with disabilities are less likely to attend or be enrolled in school, including in the aftermath of or during a humanitarian crisis (27)(99). Low school enrolment rates for children with disabilities can persist long after the crisis: for example two years after the 2010 Haiti earthquake, children with disabilities were still much less likely to be enrolled in school than children without disabilities (27). As a result, exclusion can be perpetuated by solely using schools to identify and gather data on children with disabilities and their AT needs in order to provide them with AT services (99).

Children are often reliant on their families for access to assistive products. Many families in LMICs are concerned about the stigma associated with having a disability. As a result, families may hide their child's disability or hide their child altogether: both strategies inhibit families from seeking assistive products (113). Negative attitudes regarding disability may lead to a belief that little can be done to alleviate impairments. These beliefs can extend to healthcare workers who may be unused to treating children with disabilities and therefore may provide inappropriate service or refuse to provide services at all. Parents may also have low expectations of AT products and services, and believe their child should be grateful for any product, even if it is not appropriate to their needs (110).

There is a negative and mutually-reinforced relationship between stigma and provision: the less frequently AT products and services are sought, the less they are known about and provided by the relevant service providers. When services are of adequate quality, and parents see improvements in their child's impairment, parents are more likely to continue to seek healthcare services, even in cases of social stigma (114). Parents are also more likely to seek healthcare for children with disabilities when they receive emotional support from peers who have an encouraging attitude (113).

Experience of stigma can vary based on the type of disability or an individual's status in society. In some contexts, there may be more stigma related to war-related injuries based on a perception that the victim of injury has been a combatant (69). In other contexts, the state may prioritize people with disabilities who were injured in combat (115), and they may be viewed as 'sacrificial heroes' (116). These different cultural perspectives on those injured in war may also affect children in cases where children are recruited in war.

Hierarchies of disability sometimes operate related to types of impairment: for example, in some contexts attitudes towards physical impairments are more positive than attitudes towards intellectual impairments (117). These attitudes may affect the types of AT product that are accepted by communities: for example evidence from South Africa suggests that parents may be more accepting of AT products that support physical impairments than AT products for other impairments such as communicative devices (110). Children with cognitive disabilities may experience particularly high levels of stigma, and this stigma may extend to their caregivers (25). Hierarchies of disability can limit children's access to assistive devices and rehabilitation services, and also limit academic attention to some disabilities over others (117).

Access to AT may also be affected by other social hierarchies. A review focused on factors associated with AT access found two studies showing striking gender inequalities in access (118). In one example in Afghanistan, a study found that of a group of 27 women with lower-limb impairment, none received an orthopaedic device, while only 35 per cent of men with this impairment had not received a device (119).

### Access to AT is constrained by low awareness

There are cases where AT is available but simply not accessed. In some this may be due to a lack of awareness of such services, including knowledge of the range of products available, or a lack of understanding by potential users or caregivers of the benefits of such services (69)(111). Awareness of AT benefits among both providers and recipients is a key determinant of whether or not they are accessed (69). Lack of awareness regarding how and where to access products is also a common barrier to access (69)(111). In a number of studies of self-reported unmet need, the most common or second most common reason for not using an assistive device was not knowing the types and availability of products and services that could help them (65). Relatedly, families and children themselves may also have no awareness that they have a disability at all. This may particularly affect children with less visible disabilities, such as children with cognitive or communicative impairments. The resulting low demand for AT services is likely to negatively affect the supply of assistive products designed to mitigate or overcome such impairments.

### Access to AT is constrained by poverty

There is an association between poverty and disability, which persists in a humanitarian context (67). People with disabilities are often forced to leave employment when they acquire an impairment or fail to find sufficiently-paid employment. Families of children with disabilities are more likely to be in debt. The care of children with disabilities is financially demanding and takes away parents' time. Poverty may also cause disability, as poor families find it harder to access the healthcare needed to avoid acquiring secondary disability or co-morbidities that can further disable children (97). Healthcare costs generally can be prohibitively high, both before, during and after a crisis (120)(99).

Where government systems are unable to provide access to appropriate AT products, families' own resources are a key factor in whether appropriate AT can be sourced (110). Assistive technologies are too costly (111) for those who experience a crisis and have competing priorities on their limited financial resources. Affordability is frequently cited by people with disabilities or their families as the main reason they are not able to access necessary devices (69)(121). It should be noted that cost is similarly a barrier to accessing healthcare for people with disabilities in HICs (122), and in HICs access to AT is also often limited and inequitable – it is not specific to LMICs or humanitarian settings (123).

## 5.2 Within-crisis barriers (external to the humanitarian system)

### Worsening of existing infrastructure and provision



In emergency settings, there is likely to be a number of crisis effects that prompt the need for humanitarian support, and which constrain AT access and provision.

In humanitarian contexts, where it is important to underline that provisions for AT and children with disabilities under the CRPD apply, there are usually no specialized institutions or facilities available for children with disabilities in the first place, and previously existing facilities are likely to be damaged as a result of a crisis (101)(1). For example in Iraq, children's institutions which initially had a capacity of 5,000 (disproportionately in cities) were decimated as a result of the second gulf war (99). In an emergency, existing rehabilitation infrastructure is likely to suffer damage, further reducing resource-limited environments' capacity to deliver rehabilitative services to people with disabilities (124)(15). For example, after the 2010 earthquake in Haiti, the main prosthetics and orthotics facility in the country was destroyed (86); and after the 2015 earthquake in Nepal, hospitals suffered damage (82). Following the 2013 Typhoon Haiyan, in some areas all rehabilitation services were seriously impacted, with both therapeutic equipment and medical records being destroyed. Shops selling assistive products were similarly damaged (83).

The institutions that are responsible for supporting or coordinating response, such as NGOs, United Nations agencies and government agencies, may also be affected by the destruction of physical infrastructure and the injury or death of personnel (120). In emergencies, deployment of rehabilitation services to affected populations may be hindered by damaged infrastructure, for example inaccessible roads and other transport (124)(85)(13).

Centralized health administration systems are likely to break down in a crisis, and this negatively affects medical care at multiple levels (124). Disruption to health services can persist many years after a crisis ends (125). There are often fees related to follow up, and financial costs associated with travel to access specialist support (50). This is a particular barrier in crises when the predominant modality of provision is hospital-based (13).

### 5.3 Within-crisis barriers (internal to the humanitarian system)

There is an existing and growing body of guidance and standards for AT provision developed by multilateral agencies and organizations involved in humanitarian relief. However, as discussed, there is an absence of evidence of significant or systematic AT provision in humanitarian settings. This section identifies the available evidence for *why* AT provision by response agencies and host governments may be limited.

#### Who is responsible for AT provision in a crisis?

When international assistance is requested and provided in an emergency, a cluster response or refugee response is put in place in order to ensure coordination between national government, the United Nations, other multilateral agencies, donors and NGOs. The cluster system is intended to manage the complexity of humanitarian response, and ensure the responsibilities of different actors are clear (1). The challenges of providing coordinated rehabilitation services in a crisis are well documented and there is agreement in the literature that the quality of coordination frequently and directly impacts humanitarian response quality (126)(13)(127).

In practice, despite the existence of coordination systems, it can be unclear who is responsible for AT provision in a crisis, and there may be multiple available leads for this task (94). Rehabilitation coordination in crises has frequently been poor (85)(84), as has international medical team coordination (124). There is much more academic focus on barriers to coordination of agencies in the early stages of a crisis response, and less focus on longer term response, of which rehabilitation and AT provision must necessarily be a continuing part (127).

Humanitarian organizations often categorize disability as a ‘cross-cutting issue’. In some cases, this designation may contribute to the likelihood that no agency assumes responsibility for the task of rehabilitation services for people with disabilities in a disaster (9). There may also be a lack of leadership coordinating and prompting different agencies to contribute to provision. For example, in emergency settings there may be no senior leader responsible for rehabilitation services within the Ministry of Health (87). If there is no effective leadership or coordination body for rehabilitation services, and AT services are narrowly defined as the responsibility of rehabilitation services, then by extension there will be no responsible body for AT provision.

There appears to be a gap in the *guidance* for coordination of AT provision. Most guidance documents address the importance of conducting AT needs assessments and responding to those needs, but say little on how to do so, and how to ensure activities are conducted in a coordinated manner, and at scale. While the CRPD is clear that governments and international agencies have a responsibility to ensure that all people with an AT need can receive one, humanitarian agency guidance documents do not make explicit that a large proportion of children with AT need in a crisis are those with pre-existing



#### WHAT IS HEALTH-RELATED REHABILITATION?

WHO has described rehabilitation as “a set of measures that assist individuals who experience, or are likely to experience disability to achieve and maintain optimal functioning in interaction with their environments” (11). Rehabilitation is distinct from immediate medical treatment focused on saving lives: rehabilitation aims to optimise the functioning of a person who has a disability. Rehabilitation is needed from the point when an impairment is acquired, and can continue throughout a person’s lifetime (17). Effective rehabilitation is multi-disciplinary and considers the range of environments in which the patient lives and the range of activities they take part in. All AT provision is therefore part of rehabilitation provision, but not all rehabilitation services include AT. AT provision is one of the most important parts of rehabilitation services, and this is particularly the case following a crisis that likely significantly increases the population with an impairment. Studies have shown that effective provision of rehabilitation services and AT products are crucial to preventing higher prevalence of long-term disabilities following a crisis (44).



#### REHABILITATION SERVICES MAY NOT ALWAYS INCLUDE AT PRODUCT PROVISION

Though the provision of AT products is clearly a crucial part of rehabilitation in a crisis, the literature on crisis rehabilitation rarely discusses assessment of AT needs or AT provision. This may point to low levels of AT product provision as part of rehabilitation services, or to rehabilitation services that are restricted to the crisis’ acute stage of the crisis, rather than continuing to meeting longer-term needs. For example, one systematic review examined literature on rehabilitation related to eight crises: in only two of the eight crises did the literature refer to AT product provision as part of the rehabilitation services provided (84). This review also found that the two most common forms of rehabilitation services in crises were physical rehabilitation and prosthetic provision. Rehabilitation services as part of humanitarian response must go beyond immediate treatment of injuries, to include concern with long-term functioning, a necessary part of which is assessment of a patient’s AT needs (17).

disabilities, and that those children are within the scope of the humanitarian response.

Poorly coordinated provision misses opportunities for getting children with acquired disabilities the AT they need, even when AT may in fact be available in the system. Mapping available rehabilitation services and AT providers is a crucial gap in sudden-onset disasters (83). Poorly coordinated provision and ineffective record keeping regarding both beneficiaries and services can also lead to *over*provision to some individuals in crises – for example there have been anecdotal reports of cases where people with disabilities have ‘shopped around’ and received multiple prostheses, when only one was required (120). Those who benefit from this lack of coordination among agencies may do so at the expense of others who need devices or may sell their prostheses or otherwise abuse overprovision.

### Stakeholders fail to gather data systematically on the needs of children with disabilities

Lack of data, or inconsistent approaches to gathering data by different organizations, is consistently identified as a key barrier to provision, including in camp settings (128)(120)(129)(85). Lack of data means that the extent of AT need is usually unknown. This constrains both the ability of stakeholders to advocate for AT to be prioritized and the ability of providers to plan provision, implement programmes, follow up on provision, and assess effectiveness (130)(120). In the chaos of a sudden-onset response, there is rarely even consistently gathered and comparable data on the caseload of medical response teams or surgical teams (120), let alone data on children with pre-existing disabilities. This limits longer-term coordination between different providers and responsible actors in a humanitarian setting (13).

Facilities that might otherwise be used as convenient or appropriate sites for identifying children with disabilities – such as schools or early childhood development (ECD) services (128) – are likely to be seriously incapacitated in a humanitarian crisis, or used for other purposes. For example, ECD services tend to be non-existent in very low-resource environments. Unless such facilities are replaced, or indeed improved (through humanitarian aid), the ability to gather data on children’s AT needs will be further constrained.

Different stakeholders use varied definitions of ‘children’ and different age group definitions when recording data related to children’s injuries in emergency settings, and this presents challenges to coordination and meeting needs (46). Gathering data on children’s AT needs is always challenging and using face-to-face, door-to-door discussions using the WHO’s priority assistive products list (APL) would likely be difficult during the initial stages of a disaster.

### Acute needs may be prioritized at the expense of rehabilitation

There is increasing acceptance of the importance of early/immediate provision of rehabilitation services for those with existing and acquired disabilities in disaster settings (9), but it is still a relatively nascent concept (87). Historically, there has been greater emphasis on acute care in disasters, rather than early rehabilitation interventions (107)(131). This ‘surgical bias’ leads to an underinvestment in rehabilitation services (17) and, therefore, an associated underinvestment in AT provision. In crises, even Organizations for Persons with Disabilities (OPDs) tend to prioritize disabled people’s other needs, for example basic essentials such as housing and food, as opposed to physical rehabilitation (63).

There is evidence that both rehabilitation service providers and people with disabilities in general consider the provision of AT “indispensable” in an emergency (87) – but this is not reflected in the resources allocated to AT in a disaster, which are rarely sufficient.

Rehabilitation services require the coordination of many different professional actors and organizations (87). Local and foreign emergency medical response teams have not historically provided significant rehabilitation services (132). When services are provided as part of humanitarian response, they are often of limited quality or provided too late, and are rarely able to meet the high levels of need for children or adults (17)(84).

In contexts where infrastructure is already poor or where it has been seriously damaged as a result of a crisis, the need for early rehabilitation after a disaster is more urgent, because people with disabilities require a higher level of function to return to the communities where they are originally from and return to work and life (1). This is because there are likely to be particularly high barriers to functioning for those with impairments in these contexts, because facilities in their local area are unlikely to make provision for access to mainstream services (e.g., ramps for people with mobility impairments) (133). Furthermore, long-term rehabilitation is particularly important after disasters in LMICs, because emergency surgical procedures may not be optimal and, therefore, people who have undergone surgery or emergency treatments may face particularly high levels of impairment and have longer-term needs (134)(133)(124). Lack of rehabilitation services in humanitarian settings leads to longer-term negative outcomes for people with disabilities (124).

As with literature on AT provision, there is very limited academic literature on rehabilitation in crisis setting more broadly, though academic interest in this issue has grown in the past decade (84). There is little literature evaluating or describing models of rehabilitation provision or rehabilitation coordination (84). There is evidence, however, that rehabilitation interventions were mobilized in a number of recent emergencies (including the 2010 Haiti earthquake, 2008 Sichuan earthquake and 2008 Bangladesh Sidr cyclone) (135). Where rehabilitation services and needs assessments are available, they are often provided by international NGOs (92).

Even where rehabilitation services are provided, there is evidence they are characterized by a short-term, surgery-focused approach in the acute phase of the crisis (136). The focus of medical teams on acute medical care and surgery may be a reason why the evidence on provision of prosthetics and orthotics is overrepresented compared with other assistive devices. This literature review found that even the literature on mobility devices does not address the question, ‘what works?’ to set up or maintain an effective system of AT product provision in a humanitarian crisis. This corroborates the findings of previous literature reviews that identified very little research on the provision of prostheses and orthoses in LMICs – though those products are the most represented in the literature (137).

## Failure to address injured children’s long-term rehabilitation needs through EMT-provided AT

The WHO Emergency Medical Teams Minimum Technical Standards and Recommendations for Rehabilitation (138) recommends that local teams should provide assistive products and rehabilitative follow-up services (as opposed to visiting teams). These guidelines assume there are local providers for AT products, which most often is not the case. There is also evidence that EMTs sometimes do not regard rehabilitation as part of their responsibilities and rely on limited or absent local providers to provide essential rehabilitative care that is required after initial acute care/surgical intervention (107). Rehabilitation professionals may be unaware of

the different AT needs of children in crisis settings or how they differ from adults' needs and the common injuries children sustain in a crisis (36)(88).

### AT provision through EMTs fails to address the needs of children with pre-existing disabilities

According to WHO guideline recommendations, only those children who have been recipients of emergency healthcare and whose impairment was identified as part of an emergency response would get AT and rehabilitation provision after the acute phase of the crisis has passed. Consequently, this precludes the many children with disabilities who have lost their assistive device(s) during the emergency, or children who have never been in contact with health workers (emergency or otherwise) and have never had their impairment identified. For example, a 2001 study in Haiti found that only a quarter of 164 interviewed amputees had ever had a prosthesis (70), suggesting that when the earthquake hit Haiti in 2010, a large proportion of the population with disabilities that the humanitarian response served may have never had their needs met.

### Disconnect between type of AT need and provision

There is more investment in the provision of some assistive technologies over others in humanitarian crises, and this is often not proportionate to the level of need for that technology. For example, after the 2010 earthquake in Haiti, prosthetics received the most attention, despite amputations accounting for only 6 per cent of recorded impairments (94). Of the 27 organizations providing rehabilitation services, 15 were prosthetics and orthotics services (86). This is likely to have led to under-provision of other devices and associate expertise for which there was a greater need (120).

The mismatch between the types of AT needed in humanitarian settings and the types of products that are prioritized and provided is in part driven by donor priorities – for example, in Haiti, donor funding was restricted to prosthetic provision. The reason for this is hard to ascertain. Some suggestions have included the influence the media exerts on donors' priorities and understanding of need, and the lack of high-quality needs assessment (94)(120). This disconnect between needs and provision mirrors the disparity in available evidence, where prosthetics and visual aids are overrepresented in the literature (66).

### Limited awareness of AT needs and discriminatory attitudes within response agencies

Decision-makers and response agencies in crises are often unaware of or underestimate the prevalence of disability in the affected population, or the needs of people with disabilities (139), and this is likely to drive the lack of prioritization of AT provision. One study suggests that even agencies, that *are* aware of the needs of people with disabilities, may see an ethical dilemma in the choice between the assignation of large financial expenditure for few people versus the assignation of smaller financial expenditure for many people (118). AT provision for children with disabilities (as opposed to adults) may face particular challenges in crises. Rehabilitation professionals may not understand the different needs and vulnerabilities of children in crisis settings and how they differ from adults' needs (36)(88).

This lack of awareness is evidenced in the inaccessibility of mainstream, basic humanitarian provision to people with disabilities, including shelter. Both the shelters and facilities within them are commonly physically inaccessible to people with disabilities (139). Basic services such as food and medicine may not be accessible to people with disabilities in humanitarian shelters (139). The inaccessibility of shelter provision to people with disabilities further reduces the likelihood that response agencies will know how many people with disabilities need specialist provision, and the type of provision they need (139). Even when disaster risk reduction or disaster response plans specifically consider the needs of people with disabilities, implementers may still fail to respond because of ingrained discriminatory attitudes among service providers (140).

### Proliferation of NGOs and a failure of NGO coordination

In a humanitarian crisis there is often a rapid influx of resources, NGOs, and sources of funding and provision (102)(94)(141). After the 2010 earthquake in Haiti, it is estimated that 600 organizations provided some form of humanitarian aid in Haiti, with 274 providing health services (120). These are estimates because of poorly coordinated record keeping (120) – a common feature of emergency settings. A sudden proliferation of aid agencies can impose, rather than alleviate, challenges to the coordinated delivery of essential rehabilitation services (88). In addition, international rehabilitation services are rarely coordinated with national systems, which is likely to negatively impact AT provision (9).

In response to the challenges of coordinating this influx of actors and resources, donors and other humanitarian response agencies may attempt bulk procurement of AT products in order to centrally manage provision. Such a decision should be considered carefully, as bulk procurement may in fact hinder access to appropriate AT products, because it can dissociate purchasing decisions from the needs of people with disabilities (142).

In LMICs, NGOs tend to be the main provider of AT, even before a disaster (69), and this model of provision may reinforce a perception that assistive devices are a charitable contribution, rather than a right (69). However, in some cases private sector organizations and NGOs have filled a significant gap in AT provision, where the government fell short (87). Some studies point to the potential positive role foreign NGOs can play in advocating to national governments regarding AT provision (62), including when disasters hit (87).

### Evidence on the effectiveness of NGO-donated AT is mixed and insufficient

The available literature paints a mixed picture of the impacts of charitable donations of AT (12). There are many documented cases of well-intentioned but ultimately harmful ‘dumping’ of donated assistive technologies by NGOs without ensuring they will meet needs, are appropriate or accompanied by necessary support services (81)(94). The influx of donated AT and rehabilitation equipment may however, stimulate longer-term establishment of rehabilitation services in affected countries, and encourage attempts to ‘build back better’ (132).

A consistent theme of the literature emphasizes that a system for effective coordination of providers and for data collection is critical for ensuring AT is provided according to needs. A summary of lessons learnt from the 2015 earthquake in Nepal found that assistive products were often donated to central hospitals without a clear consensus on referral pathways, and without links to specialist rehabilitation units, leading to products not reaching those who

needed them most, or not meeting needs (81). Without coordination, a reliance on NGO support for all AT can undermine the government's role in rehabilitation and limit the sustainability of improvements in rehabilitation capacities (143)(144).

## 5.4 Assistive technologies: by nature a hard problem?

There are AT characteristics that may make them harder to provide compared with other products commonly provided in humanitarian contexts (see, for example, the products in the UNICEF supply catalogue (145)). Commentators have noted that the range of AT uses and the many different types of AT product makes providing AT a complex challenge (142). There is, therefore, no 'one size-fits-all' solution to meeting AT needs, making provision even more challenging than, for example, vaccinations, where market-shaping approaches have been successfully used to scale-up provision.

Acknowledging this complexity, it is important that humanitarian actors consider barriers to AT access holistically, because any intervention that only alleviates one barrier without considering the interactions of different factors is likely to be unsuccessful. For example, the well-meaning donation of expensive AT products to crisis-affected countries by organizations in HICs is known to have limited effectiveness, and is driven by a narrow focus on the cost-barriers related to AT access (110). Any intervention focused on AT access must consider and address the range of issues highlighted in this section, including the importance of providing suitable devices for the environment, coupled with appropriate associated support and maintenance, without which AT may be abandoned by the intended user, or cause harm.

### Assistive product provision is currently costly, especially for children

Assistive products and the establishment of associated rehabilitation services are expensive compared to other essentials (131). Much of the recent innovation in AT products has been driven by HIC contexts and, therefore, resulted in costly, high-tech solutions that are not appropriate or scalable in humanitarian settings (64)(112). AT cost is also partly a result of low sales and low-scale manufacture which means economies of scale cannot be achieved – this extends even to mobility aids such as prosthetics, orthotics and wheelchairs, which are comparatively more available than other AT products (142).

AT products are **particularly** costly for children, as they need to be regularly replaced as they are outgrown (70). This is another factor that sets them apart from other emergency products in the UNICEF supply catalogue, of which some can cause harm if not replaced. Some types of AT product cannot be distributed without long-term associated services that require trained personnel. Prosthetic replacements are usually required annually up to age 5, biannually up to age 12, then every 3–4 years until age 21. Similarly, orthoses require regular replacement or adjustment as children grow, or children risk long-term physical injury caused by poorly fitting devices. Battery-powered products, such as some types of hearing aids, may require the recurrent expenditure of battery replacement.

AT products may also require repairs and servicing, which implies a long-term cost to the provider, as well as possible costs to the user who necessarily seeks ongoing support for their AT services. One study in Malawi found that users of prosthetic and orthotic devices were most concerned with access to repairs and servicing, durability and follow-up services. They also reported that being unable to pay for transport limited their ability to access prosthetic and

orthotic centres (100). Any humanitarian response agency intending to scale-up AT provision must consider long-term costs beyond the cost of the device, including upkeep and ongoing needs (146). One policymaker has argued that AT investments in LMICs should begin with low-cost AT products such as canes and pencil grips, before moving onto higher-cost items such as hearing aids (146).

### The diversity of AT products and needs makes them difficult to procure equitably

As States often categorize AT as medical products, they may attach strict legal requirements to AT distribution by NGOs or other actors in an emergency (64). In emergency contexts where there is an urgent need to get AT to the children who need it, those legal requirements may be unrealistically high in terms of what it is possible to procure cost-effectively in the quantities needed, within the urgent time constraints of a crisis response.

The heterogeneity of assistive products increases the difficulty associated with their provision. There are so many assistive products – WHO's priority assistive products list includes 50 (61) – and many variations of each individual product. As yet there are no minimum standards for the majority of assistive products (94). WHO is in the process of developing minimum standards for priority assistive products – these will be an important step in alleviating the burden of differing and excessively high standards for products. However, manufacturers will need to respond to these minimum standards with corresponding products, if the market is to shift to the production of products that can be distributed in a crisis. Having strict legal requirements levelled on each product which procuring agencies then need to respond to may pose a costly and complex administrative challenge.

### Needs are unpredictable

IASC guidelines recommend that in the absence of data, humanitarian responses should assume that 15 per cent of the population affected by crisis has a disability. It recommends that 0.5–1 per cent should be budgeted for physical accessibility of facilities and services, and a further 3–7 per cent should be budgeted for non-food items and specialist equipment for people with disabilities (79). However, there is little evidence of the types of AT and the relative proportions of each that would be needed by the child population in a humanitarian setting. The need is likely to be affected by the context and type of disaster. When disaster affects a LMIC, we can infer that much of the need is likely to come from children who had a pre-existing disability and never had access to the AT they needed. This is because of the high estimates of disability prevalence and AT need in LMICs, and the historically relatively lower rates of child injury responded to by EMTs. However, the prevalence of longer-term acquired disabilities as a result of the indirect effects of crisis are hard to quantify: in the long term these injuries may significantly contribute to the prevalence of child disability in a population.

### Assistive devices need to be tailored to the child and setting

Children in crises need ATs that are appropriate for the emergency setting they live in, and appropriate to their needs. Children with disabilities in emergencies may need different things from their assistive devices than adults (e.g., simplicity, adaptability to the growing body) and may have different needs to children with disabilities who do not live in emergency settings



(e.g., use in harsh natural environments, use in play or school settings) (147). Emergency settings may have challenging terrains, which may make conventional ATs, for example wheelchairs or even crutches, ineffective (112).

Assistive products that are not adapted to the user or their environment are likely to be abandoned (106)(112). Poorly fitting products that cause discomfort are particularly associated with abandonment, and this is a particular concern with the fitting of prostheses and orthoses (50)(106). There is very little research and development of products that are appropriate for an emergency or LMICs (111)(106), in terms of being low cost, low tech and environmentally appropriate to deal with uneven ground or other features of the natural environment that children with disabilities must navigate. We found no research and development on products for LMIC/emergencies that specifically considered the children's needs.

## 5.5 What are the evidence gaps relating to the barriers to AT provision in humanitarian settings?

- Reference to AT needs and provision is not included in the majority of current HRPs and RRP. **More evidence on the drivers for inclusion/exclusion of AT in HRPs and RRP**s would be valuable.
- Lack of financing is likely to be a major barrier to AT provision in crisis, though there is no evidence in the literature regarding this. In a humanitarian or refugee crises, humanitarian agencies and the State often struggle to secure adequate financing even for the provision of the most basic, lifesaving items (such as food and clean water). In such circumstances, AT is likely to be de-prioritized in strategic response plans due to its expense. **More evidence on how and why AT provision has been financed in humanitarian settings** (if examples of this exist) would be valuable.
- There are humanitarian contexts where many barriers to provision ought not apply. In crises where provision occurs in camp settings (e.g., internally displaced persons or refugee crises) many of the infrastructure barriers listed above do not exist, or should exist to a lesser extent than in other humanitarian settings. There is limited evidence from the grey literature that some form of provision or facilitation of access exists in camp settings, but the *how* of provision is not documented, and significant gaps to access still exist. **Evidence on the nature of coordination and provision of services in such 'controlled', protracted humanitarian settings** would be valuable in understanding why provision gaps persist.

## 6. Facilitators of provision: what is known about what works?

This section summarizes the interventions the literature suggests are associated positively with greater coverage or better quality of AT provision in a humanitarian crisis. A key finding of this review is that the evidence base on interventions to improve AT provision in crises is weak. The review found no academic literature examining the impact of any programmes or interventions – whether delivered by government, international humanitarian response or coordination agencies, or specialist NGOs – with the **primary** objective of improving or increasing AT provision in humanitarian settings. This corroborates the findings of other literature reviews, including a systematic review, that have found very few studies of the models and processes of AT provision in LMICs and little evidence of the role of national governments in these processes (148)(118).

The lack of literature may not be evidence of a paucity of interventions on AT in humanitarian settings. There may be a ‘mismatch’ between the quantity of literature available and the number of interventions and initiatives undertaken by aid agencies, for which there is limited documentation (29). One review speculates that humanitarian agencies’ work on disability is not well documented

because there has historically been little incentive to demonstrate results against targets on disability inclusion, and no global indicators to track progress (29).

As a result of the lack of literature focused on AT provision in humanitarian settings, the literature we draw upon below is primarily from reviews summarizing general ‘lessons learned’ from humanitarian crises of the last 20 years. These reviews rarely have AT as their primary concern, but may still offer useful lessons on how rehabilitation systems generally can be better structured to meet the needs of people with disabilities in crises. It should also be noted that the majority of the available literature is not specific to children or adolescents with disabilities, but relates to all people with disabilities: as a result, a weakness of this literature is that it may not consider the differing circumstances and needs of children.

The evidence base is, therefore, not sufficient to make robust policy recommendations. However, the findings of this review do provide insights and principles to consider when planning interventions that aim to improve AT access, as well as some promising approaches to improving AT access.



### MARKET SHAPING APPROACHES

Significant work is being undertaken by initiatives such as [AT2030](#) and [ATScale](#) to identify ways to shape the AT market in order to scale up AT access and provision in LMICs. This includes research to identify barriers to the development of low-cost assistive products and local AT services, and the development of a local manufacturing base tailored to LMICs. The interventions and evidence resulting from these initiatives could be a key facilitator to improve markets and systems for AT provision in humanitarian contexts. AT2030 and ATScale take a ‘systems approach’ in order to consider the many interplaying levers that are likely to impact AT provision and access in LMICs. These factors include (but are not limited to):

- Technological innovation, e.g., 3D printing (166)
- Financing innovation
- Market shaping
- Policy and regulatory frameworks

## 6.1 Principles for improved healthcare services in humanitarian crises

There are no studies that look specifically at the issue of how humanitarian systems can improve AT access, whether at the level of response coordination, healthcare provision or rehabilitation provision. There is evidence in the literature, however, regarding key principles of inclusive humanitarian systems at each of those levels. Adherence to those principles is likely to support an enabling environment for AT interventions. However, it should be noted that there is no evidence to suggest that any of these principles alone or together will improve AT access – they simply represent minimum standards for humanitarian response which are likely to be important for the improvement of AT access. These principles are necessary but not sufficient to the improvement and scale-up of AT access in humanitarian settings. The principles cover 'system strengthening'; inclusion of children with disabilities in disaster risk reduction (DRR) and preparedness planning; and partnership with local civil society organizations. These are summarized below.

## Systems strengthening

The literature emphasizes the importance of humanitarian response being designed with a focus on sustainability and systems strengthening, as opposed to setting up parallel systems (149). Disasters are sometimes seen as unique opportunities to strengthen systems rapidly (150) and to build back better. These opportunities have had some success in, for example, Haiti and Nepal (1)(102), which have seen an increase in health services following major crises. Landry et al., (2016) describe the systems strengthening approach as having three pillars: risk reduction, community recovery and coordinated implementation of policy (1).

## Inclusion of children with disabilities in disaster risk reduction (DRR) and preparedness planning

While there is little information about the impact of inclusive DRR planning on AT specifically, there is a body of academic literature that finds that children with and without disabilities can benefit from being part of the development of disaster planning and humanitarian action (14)(151–153). DRR is an approach to identify and reduce the negative impacts of disaster. It includes the policies, plans and standards put in place to strengthen resilience of a country, region or community to disaster. It may include actions such as risk assessment for different vulnerable population groups, the development of evacuation plans, or capacity building of government and partners to prepare for emergency (154).

The Sendai Framework for disaster risk reduction (2015–2030) states that governments should engage with children, adolescents and people with disabilities when designing policies, plans and standards. The Sendai Framework draws on evidence to demonstrate that the inclusion of people with disabilities can improve the effectiveness of DRR for people with disabilities, and improve the accessibility of facilities and products to all of the community, including people without disabilities (130).



### IN PRACTICE: MEASURING DISABILITY PREVALENCE

#### IN HUMANITARIAN SETTINGS

Humanitarian actors are increasingly aware of the need to gather data on disability prevalence and AT needs. This awareness is reflected in the guidance for humanitarian agencies and in increasing adoption and use of the Washington Group Child Functioning module, the MICS Ten Questions (TQ) tool and the WHO's ATA-N tool. This review found several studies since 2010 that test approaches to measuring the rate of AT need in a population in LMICs (68)(155)(156)(172)(65). These studies suggest that agencies concerned with AT provision should carefully consider whether the measurement tools they use fully capture the whole population of children with disabilities.

For example, one study demonstrated that neither clinical measures nor Washington Group measures of functional impairment *on their own* were successful in capturing the population with a disability in LMICs (172)(68). Used alone, both tools significantly underestimated disability prevalence. The study suggests that it may be more effective to use the Washington Group questions to identify the population who self-report 'some' level of functional limitation in a given domain, and then use clinical tools to understand the impairments and needs of that population better. The study found that this approach could identify 95 per cent of those with a disability, but may not adequately capture some impairments, particularly those related to cognition and mental health. The study points out that this approach to gathering data is possible using 'mid-level clinicians' rather than specialists, and can be made more efficient by using innovative mobile tools to screen impairments (172).

Similarly, tests of the TQ tool found that secondary testing was needed to identify milder disabilities. The TQ tool may be the most commonly used tool in LMICs (173).

These studies also highlight the importance of developing indicators and metrics to measure interventions' impact related to disability (155)(156)(95). Such measures are likely to be a key accountability tool to incentivize humanitarian actors to act on the guidance that mandates provision of AT access to those with AT needs (29).

**Partnership with local civil society organizations** There is agreement in the literature that humanitarian agencies must ensure they fully involve local and national stakeholders in the coordination of rehabilitation services (141). This was a key lesson learned from the 2010 Haiti earthquake (28). Haitian civil society institutions, including DPOs, felt that international NGOs and even Haitian officials were unaware of the existence of local disability expertise, and knew little about the needs of those with disabilities. DPOs felt excluded from the humanitarian cluster coordination system. INGOs often coordinated directly with the Haitian government, circumventing Haitian organizations with, for example, experience in provision of prosthetics. The increased integration of local organizations became a crucial part of improved services for people with disabilities. Civil society organizations also played a part in holding response agencies to account for the provision of services to people with disabilities: for example a civil society coalition reported on the progress of government initiatives to improve AT access, and found that people with disabilities still did not have access to free health care (28).

Interventions by large-scale humanitarian response agencies are more likely to contribute to sustainable, long-term systems if they integrate the expertise and voices of local DPOs, civil society organizations, and people with disabilities. With the support of humanitarian response agencies, civil society organizations can be important advocates for increased services for people with disabilities after a crisis, and can advocate not just for AT, but for longer-term investment to create more accessible environments, including accessible housing, transport and infrastructure (16).

## 6.2 Scaling up AT access must be underpinned by improved data systems

Effective data gathering on the prevalence of and needs of people with disabilities has consistently been identified as a crucial foundation for the delivery of AT and



### COULD NEW TECHNOLOGIES IMPROVE AT AND DISABILITY DATA?

WHO has long promoted the use of mHealth – the use of mobile phones, applications and other wireless digital technology to provide healthcare. Supply and demand for mHealth has increased over the past decade, and there are examples of the effective use of mobile applications for AT needs assessment in HICs (174). As mobile phone and internet penetration increases in the developing world, mHealth for AT provision may be increasingly feasible even in emergency settings.

A promising example comes from lessons learnt from the 2008 earthquake in Wenchuan. The disaster gravely damaged the computer network, that prompted a move to a mobile phone situational reporting system, which proved effective (141). This suggests that, in some crises, mobile systems for AT needs assessment may be a feasible approach.

There have also been innovations in disability screening tools using mobile apps: for example a range of apps for hearing assessments (173). These have not yet been tested in LMICs but could have future value.

While many people with disabilities in LMICs currently may not be able to access a mobile phone (and there is a digital divide in many LMICs for women and people with disabilities), in the longer term this may be a potential avenue for either accessing AT products, or the mobile phone may be itself used as an AT product – for example as a communication device or as a cognitive aid (142). A rapid response briefing on the inclusion of people with disabilities in humanitarian response identifies three key principles for using technology to improve inclusion (154):

- 1) Technology must be designed based on an understanding of the needs and limitations of its target beneficiaries.
- 2) Aid programmes that adopt technology, should be incentivized to include people (and children) with disabilities explicitly.
- 3) To avoid technology contributing further to the exclusion of people with disability, they must be included at each stage of the programme cycle, otherwise technology may become another means of exclusion.

associated services in humanitarian settings, and a consistent recommendation of assessments of the quality of rehabilitation in crises (155)(156)(135)(91)(129)(1)(83). Humanitarian actors also need tools to measure the outcomes and impact of interventions for people with disabilities (155)(156). It is essential that humanitarian actors have robust data on the prevalence of disabilities in a population, as well as information on the rehabilitation needs of the population as soon as possible after a crisis occurs (92). A lack of disability data, however, should not preclude humanitarian response agencies from responding to the needs of people with disabilities. IASC guidelines suggest that in the absence of data, crisis response planning should assume that 15 per cent of the affected population live with a disability (79). This section summarizes the evidence on best practice for improving data systems with the specific objective of improving AT access.

### Gathering data on *all* children with unmet needs, not just those who receive emergency care

A lesson learned from the Nepal earthquake of 2015 was the value of ‘standard data collection protocols’ for medical teams dealing with injuries in disaster response. This optimizes the chances for patients with disabilities to receive the longer-term follow up they need (1). An example of such an approach was set up after the 2010 earthquake in Haiti: an electronic tracking system for amputees was established that could be used in other settings (132). Similarly, a study examining the success factors related to rehabilitation of people with disabilities after the 2005 earthquake in Kashmir found that keeping a database of recorded injuries was crucial to ensuring long-term rehabilitation needs could be met (44). However, it should be noted that those types of patient registries would not capture the many children who had prior disabilities.

While post-disaster needs assessment is crucial, the availability of pre-disaster baseline data on prevalence and different impairments could significantly enhance its effectiveness (83). Population data should be collected and disaggregated by disability (both before and after a crisis). Preparedness planning, service registration and data collection should also include both government services and private sector providers because both these services may represent important sources of provision after a disaster, and should not be forgotten by international humanitarian agencies (1).

### Systems for gathering and publishing information on available AT services

Some commentators have speculated that providing public information on self-provision of AT may be one means to increase access in very resource-constrained environments. In contexts where there is a multiplicity of providers, publishing neutral information and a directory of services may have two benefits: improve the uptake of rehabilitation services and AT, and improve the disability referral system (83)(142)(1). Agencies could provide information on low-cost, simple ways to access or make AT products (142). In LMICS, this information will usually need to be provided either in print or orally (142).

Some studies have found that some people with disabilities – particularly vulnerable groups such as refugees – may be unable to assert their rights to services because of low self-esteem or low awareness of their rights. It has been proposed that providing people with disabilities knowledge of their rights may increase their access to health services (157).

### 6.3 Integrating rehabilitation into emergency response

Health rehabilitation services are likely to have a central role in AT provision in many settings, though many humanitarian actors working in other sectors may also have a responsibility and potential role for facilitating AT access in a crisis setting. Though there is limited literature on strengthening AT provision services specifically, the literature provides some recommendations for how **rehabilitation services** could be strengthened and scaled-up in crises. Strengthening rehabilitation services may support greater focus and investment in AT provision.

- **Integration of rehabilitation with EMT:** The literature is clear that rehabilitation services are essential to any humanitarian response (84). In commentary on lessons learned following the 2005 Kashmir earthquake, Gosney (2010) recommends that, in future international humanitarian response, physical rehabilitation professionals should be deployed alongside traditional EMT (16). Similarly, a study on the provision of rehabilitation services and AT products in the same Kashmir response found that close coordination between rehabilitation services and emergency services was a crucial factor in the effectiveness of the response for people with rehabilitation needs (44). Rehabilitation services can facilitate improved access to emergency medical care. For example, in the 2015 Nepal earthquake, rehabilitation services were crucial for arranging effective discharge from hospitals and freed up much-needed beds for those with acute care needs (16).
- **Early intervention:** For physical rehabilitation, there is evidence that early intervention is a key variable in positive outcomes (84)(16)(85)(16). Observations from the 2005 earthquake in Kashmir suggest that early rehabilitation services improved the long-term functioning of people with disabilities (48). Other important factors included quick evaluations and early establishment of temporary spinal units (48). More involvement of rehabilitation professionals at early stages of disaster response can improve triage, by reducing the number of surgical interventions that lead to additional complications and increased prevalence of disability (16). Rehabilitation can also minimize secondary harms that would otherwise exacerbate impairments or lead to co-morbidities (16).
- **Ongoing provision:** Rehabilitation services operate at the nexus of humanitarian and development interventions, and indeed *must* do so in order to meet the long-term needs of children with disabilities. Studies have found that effective rehabilitation services must facilitate and support the discharge of patients from emergency health facilities, but must also continue after discharge (85). One study proposes that field hospitals should not only be established during the immediate aftermath of the disaster, but should be developed into permanent centres to respond to long-term rehabilitation needs (43).
- **Integration and capacity-building of local expertise:** The importance of coordination of local and emergency response organizations has been observed to be of vital importance in recent disasters, e.g., in Haiti, India and Sechuan (141). It is crucial, to the sustainability of services, to build local capacity in healthcare provision, as international humanitarian support is usually temporary (158)(16)(134). Use of volunteer, external workers can sometimes lead to neglect of essential medical aftercare (91). In LMICs, occupational therapy or AT provision rarely exists and building the capacity and numbers of local AT personnel in LMICs is a challenge. Traditional training through formal systems would take too long to meet humanitarian response needs. Cascade

models, in which AT advisers train their peers may be a faster approach to building the numbers of appropriately-trained personnel to address time-critical demands of humanitarian response (142).

- **Integration of multiple disciplines in rehabilitation provision:** Response networks should include leadership from government, local and multilateral organizations (141); and rehabilitation requires an interdisciplinary approach to integrate both medical professionals (such as physical therapists and psychologists) with non-medical professionals, (such as social workers and planners) (92). NGOs are an important part of that network: they may be able to access AT products at lower costs if they cannot be replicated at scale, for example by refurbishing second-hand products(159). NGOs have also been able to negotiate pricing agreements by procuring simple technologies, and at high volumes by confirming procurement is for humanitarian use only (159).

## 6.4 Coordination of humanitarian response structures to improve AT access

There are cases where the cluster system has been successfully structured to provide clarity on which organizations are responsible for the provision of products and services for people with disabilities. A key lesson learnt from the earthquake in Nepal (2015) and Haiti (2010) was the importance of having a clear, designated 'space' for rehabilitation and AT provision within the Cluster system (1). Lessons from the 2010 Haiti earthquake suggest there are benefits to ensuring there is a disability-specific sub-cluster overseen by both an international organization and government agency (86).

## 6.5 Stockpiling



### COORDINATION FOR AT PROVISION: LESSONS FROM HAITI 2010

Following the 2010 Haiti earthquake the Inter-Agency Standing Committee (IASC) established an injury rehabilitation and disability (IR&D) workgroup under the health cluster, and appointed Humanity & Inclusion and CBM as co-leads of that sub-cluster. This sub-cluster was explicitly responsible for providing assistive products (among other services) to people with disabilities who had acquired their disability in the earthquake. The Secretariat for the Inclusion of Persons with Handicaps (SEIPH) was housed in the government's Ministry of Public Health and Population, and was responsible for meeting the needs of people with pre-existing disabilities. SEIPH and IR&D were officially partnered, to facilitate coordination (86).

Despite this relatively clear division of responsibilities, the influx of providers proved hard to coordinate, particularly given the inconsistency of their experience and capacity (86). Nevertheless, prosthetics and orthotics services appear to have met demand in the immediate aftermath of the earthquake. This suggests that this model of coordination, in which AT responsibilities were clear within the cluster system, correlated positively with the ability of the humanitarian response to meet the needs of people who acquired an impairment as a direct result of the crisis. Notably, there is no evidence available regarding the effectiveness of SEIPH's efforts to meet the needs of people with pre-existing disabilities.

As introduced in *Section 4.2*, stockpiling assistive products can be an effective means of preparation, in order to respond to urgent AT needs in a crisis. In advance of the 2015 Nepalese



earthquake, for example, NGOs were able to distribute mobility aids that had been held in reserve (81). This stockpiling was possible in Nepal because the earthquake had long been predicted. National governments of most humanitarian contexts are unlikely to stockpile assistive devices without a longstanding environmental threat. Furthermore, it is unfeasible they would have the capacity to do that when, in most cases, they lack the capacity to meet even their pre-existing population's AT needs. However, the evidence demonstrating the value of stockpiling to meet urgent AT needs may be an argument for regional stockpiles, or stockpiles held by international coordination organizations such as United Nations agencies.

## 6.6 Community based rehabilitation: Bringing services closer to beneficiaries

In line with the guidelines of the Sphere Minimum Standards For Humanitarian Care Delivery, there is significant academic and practitioner consensus that partnership with existing community based rehabilitation (CBR) programmes represents best practice in emergency rehabilitation and provision of assistive devices. Where CBR exists, international support for rehabilitation services could be linked to existing CBR services and should build local CBR capacity (101)(86), although CBR is being used less and less as a favoured approach

CBR may provide an effective mechanism through which humanitarian response agencies provide access to AT and improve the speed of humanitarian response: international response services are often delayed in the critical early stages of a crisis (particularly in the case of sudden-onset), and their limited capacity can be mitigated by effective deployment of community health workers (53). There is evidence that implementation of CBR correlates with reduced stigma faced by children with disabilities (60).

However, there is little robust evidence available to support any single approach to CBR because the definition and practice of CBR is not universal (160)(95). While there is no evidence that specifically supports any particular model of CBR for the effective delivery of AT, some of the key features of effective CBR are discussed below. As such, some of the CBR models described in the academic literature may alleviate at least some of the barriers to providing rehabilitation and AT access to people with disabilities in crises or low-resource settings.

### Characteristics of good-practice CBR for improved AT and rehabilitation services

- **Localized provision:** CBR providers may be more likely than centralized or international organizations to know where people with disabilities in villages and remote locations are (87). In some settings, a specific local demographic profile may also be better-placed to respond to the particular needs of beneficiaries: for example, after Nepal's 2015 earthquake, women community health workers were important actors in responding to the consequences of the disaster (53). Working with beneficiaries rather than for them, through the CBR model, can also build local capacity beyond the international response to a disaster (60). There is some evidence that CBR can contribute to decentralizing and expanding the provision of specialized services for people with disabilities (161), and expand awareness of those services (83). CBR can be less costly than the provision of centralized or institutional services because it can be conducted by local personnel with minimal training. There is also evidence that in low-resource settings, community-based psychosocial interventions can be an effective strategy to improve support for children with cognitive disorders, and that those programmes do not need to be delivered by specialists (162). CBR also removes barriers to AT access related to travel, by moving the site of interventions from institutions to near the homes or within local community settings (60).
- **Bridging centralised and local provision:** CBR can bridge the link between central coordination and planning and local service provision, communication and access, and



#### USING A HYBRID IBR/CBR MODEL TO DELIVER ACCESS TO REHABILITATION AFTER A DISASTER: LESSONS FROM SICHUAN

Evidence from a longitudinal study examining the effectiveness of rehabilitation services following the 2008 Sichuan earthquake found that institution-based rehabilitation (IBR) followed by Based Rehabilitation (CBR) could provide timely and effective rehabilitation for disabled populations (91). The model of CBR studied in this case involved:

- 1) close collaboration between NGOs, local authorities and professional bodies such as physiotherapist associations;
- 2) registration of professional volunteers in a database to support rapid and targeted deployment of personnel;
- 3) close linking of surgical and rehabilitation services (with AT included as a responsibility of healthcare providers) (91).


In the first stage of the intervention, patients received institution-based rehabilitation services in county hospitals. This included training in management of impairments and self-care, and provision of AT products. After discharge, patients could access CBR, with services including AT product provision and health prevention and promotion activities. The evaluation of this programme found this to be an effective model to improve the functioning of people injured in the earthquake. It found that here were slightly improved outcomes for those who received the intervention early, compared with those who received the intervention a year after the disaster.

can improve awareness of the needs of people with disabilities (83). CBR can provide an effective referral pathway (120) and connect central institutions (e.g., city hospitals) to village and community-level health personnel; this can expand provision by being truly inclusive and reaching people with disabilities **where they are** (60). The CBR model’s localized referral services can also provide a bridge between AT provision and wider services – for example, education (60).

- **Community-driven resourcing:** In some CBR models, the community itself mobilizes resources – including personnel, financing, materials and institutions. However, in a disaster setting it is likely that international organizations, government and NGOs play a significant role in CBR coordination and design (60). In these cases, it is crucial that CBR programmes are integrated into sustainable funding structures (such as national health system budgeting) rather than seen as a donor-funded ‘add on’ – otherwise, post-disaster, CBR is likely to collapse (60).
- **Collaboration with traditional/religious healers:** There may be benefits to training community healthcare providers to collaborate with traditional healers, in order to respond sensitively to children’s and their families’ needs, and discourage practices such as corporal punishment of children. Even though those who seek help from traditional institutions may experience higher levels of stigma, many families find these institutions helpful, so collaboration may be a more effective approach (25)(163).

## Disaster vulnerability focal points (DVFP)

Disaster vulnerability focal points (DVFPs) represent one model of disability rehabilitation provision that aims to bring response mechanisms “as close as possible to the affected communities” (164). This is the model used by Humanity & Inclusion to provide services for vulnerable people and those with disabilities. DVFPs are stations, managed by Humanity & Inclusion, which provide on-site and mobile rehabilitation in a crisis. DVFPs provide a holistic range of services including assistive products, training and psychosocial support to those with disabilities, as well as their families and caregivers. This may be an effective way of both identifying those in need and enabling more efficient provision to a larger beneficiary group, by virtue of their proximity to communities (165)(132)(164). However, there is no academic evidence on the effectiveness of DVFPs to scale up or improve AT access.



**IMPROVING THE AVAILABILITY OF AT**  
**PRODUCTS: UNICEF SUPPLY DIVISION**

UNICEF’s supply catalogue currently only has two AT products specifically for people with disabilities: an adult [wheelchair](#), and [a latrine add-on](#) for both adults and children with disabilities. The latrine add-on is composed of an elevated toilet seat with a support frame, which can be added to a squatting-plate to facilitate the access of people with disabilities. UNICEF Supply Division plans to add further items to its catalogue specifically for people with disabilities, driven by demand from UNICEF Country Offices and partners. If Country Offices and partners in LMICs are made aware of the availability of these products, procurement data will provide some evidence on whether product availability can improve AT product provision, and which agencies procure these products.

## 6.7 Best practice in selecting appropriate AT

There is some limited evidence from LMICs regarding best practice in selecting AT where it is available. This evidence may be useful for agencies intending to provide AT products or

services in humanitarian settings. Evidence from South Africa suggests the following for agencies coordinating AT provision in low-resource settings:

- Take a family-centred approach to selecting appropriate AT, using provider experience to work with families to support the selection process (110);
- Use school and home visits to understand the context of the child's daily life in order to provide AT that can facilitate child functioning within that context (110). These visits should consider issues like whether the child has access to electricity, in order to know whether rechargeable devices would or would not be appropriate;
- Trial AT products for a period before either the individual or the service provider purchases the selected products (110)(166);
- Consider risks in the environment: for example in LMICs, high-tech AT products may have a higher likelihood of being stolen, and therefore may be less appropriate (110).

## 6.8 What are the evidence gaps relating to the facilitators of AT provision in humanitarian settings?

There is no literature available on the nature or impact of any intervention with the specific objective of improving or scaling up AT access in a humanitarian setting. As in much of the available literature, more evidence is needed that can help different potential providers – not just national governments, but also NGOs and international agencies – to build systems that can deliver AT to those with unmet needs and develop healthcare policies that fully meet the requirements of the CRPD (118)(137).

There is little literature found on how to alleviate many of barriers identified in *Section 4*. For example, there is no evidence available on:

- how to align donor financing with need;
- the effectiveness of different models of AT provision in different contexts;
- interventions to improve awareness of and demand for AT among families of children with disabilities;
- how response agencies, including government, can best procure AT products in a crisis.

Evidence on the effectiveness of interventions to alleviate the most critical constraints to AT provision and access would contribute to filling a large evidence gap.

Some agency guidance documents refer to the provision of cash transfers for AT products, however, there is no evidence of studies demonstrating the effectiveness of cash interventions for AT.

## Closing remarks

Globally there is a grave gap between AT needs and AT provision, and this literature review suggests that this gap persists in crisis settings where international humanitarian response is in place. We identify three important likely gaps in provision that should be considered by humanitarian response agencies with a concern for the needs of children with disabilities:

- 1) AT provision is currently likely to focus on children who acquire an impairment as a direct result of the crisis, overlooking children who have lost their AT in the crisis, or who have a pre-existing impairment and have never had their AT needs met;
- 2) In the cases where humanitarian agencies consider the needs of children with disabilities, this is mostly focused on making mainstream humanitarian facilities and

services inclusive, and the specific needs of children with disabilities (such as AT) are overlooked;

- 3) Rehabilitation in humanitarian settings is likely to focus on mobility impairments at the expense of other impairments (though there is likely still a gap between mobility AT needs and provision).

Humanitarian settings present challenges to filling those identified gaps. These include pre-existing challenges, such as stigma or weak assessment and rehabilitation systems, but also challenges related to the effects of the crisis, such as worsened transport and road infrastructure. There is evidence in the literature of a range of interconnected barriers to provision in crisis that is the responsibility of the humanitarian response system to tackle. Foremost among these is the frequent failure of that system to prioritize the specific needs of children and adolescents with disabilities. Humanitarian responses rarely identify responsible agencies, or the humanitarian clusters that they lead, for the provision of AT in crises. There are no effective systems for the coordination of AT provision.

For agencies that wish to prioritize the needs of children and adolescents with disabilities, their capability to translate intentions into action may be constrained by a lack of knowledge, guidance or experience of how to coordinate, plan for and manage AT provision systems in crises. The academic literature currently offers little evidence to inform those agencies; additionally, the appropriate approach is likely to be context dependent. However, the barriers identified in this literature review offer a framework for humanitarian response agencies to assess the constraints to provision that exist in their context.

Several lessons have been identified from good practice that focus on how systems can be strengthened to improve rehabilitation provision in crisis. Those lessons include gathering and communicating public information on available services, designating responsibility for AT provision in the humanitarian cluster systems, inclusive preparedness planning (including stockpiling), community-based approaches that bring provision closer to beneficiaries, and partnering with national stakeholders.

Humanitarian coordination systems provide an existing platform for making decisions on several key AT provision issues, including:

- **Sectoral approach:** to reach consensus on how AT is coordinated, procured and distributed, i.e., through single-sector coordination mechanisms, for example, under the health cluster alone, or cross-sectoral under multiple sectors, for example, education, protection and health clusters;
- **Specialization:** to designate the scope of AT provision to specific implementers, including their geographic coverage and which single, or range of, impairments they are expected to provide AT for (i.e., designated specialist and non-specialist providers);
- **Distribution levels:** to reach consensus on the most efficient and effective mechanism(s) for delivery of AT services, i.e., to agree under what circumstances to use community, primary or tertiary healthcare levels for distribution;
- **Data collection:** to identify which data collection tool(s) will be used for assessing AT needs (e.g., rapid vs. comprehensive, which locations, target population, etc.) and designate responsibility for collection;
- **Manufacture and procurement:** to agree on the supply of AT products including options for local manufacture and international supply chains.

In conclusion, this review highlights that at global and country level it is not clear which agencies, or associated sectors, have responsibility for AT. As a result, children and people with disabilities are left behind in a typical response. Where AT is included, provision tends to favour those injured in the acute phase of a crisis and overlooks pre-existing needs. Where there is provision of WASH, education and nutrition supplies, AT is not currently included.

The review is expected to trigger consideration by responsible agencies to incorporate AT products and services into emergency preparedness planning and humanitarian response, and to focus on:

- **Effective coordination** for the provision of AT, including:
  - o Developing a global AT coordination framework for humanitarian settings, detailing the responsibilities of different agencies under different models of coordination (including the cluster system and refugee coordination model), and in settings with different levels of government capacity, as well as in disaster preparedness planning;
  - o Embedding AT provision standards as set out in the AT coordination framework into guidance documents (e.g., IASC guidance);
  - o Embedding rehabilitation inclusive of AT provision into EMTs;
  
- **Strengthening systems for AT provision**, in light of the evidence available on best practice, including measures such as:
  - o A commitment from donors and multilateral agencies to mandate humanitarian and development funding for AT provision programmes designed with consideration of the evidence on the barriers and facilitators to effective provision detailed through this and other work;
  - o Working closely with government and national stakeholders to develop strengthened AT systems, and where appropriate considering evidence-based approaches such as CBR to ensure the long-term sustainability and national ownership of AT provision;
  - o Making monitoring and evaluation a requirement of new AT programming, to build the evidence base;
  - o Humanitarian procurement teams rapidly expanding supply catalogues to include assistive products;
  
- **Designing programmes for AT provision based on analysis of the barriers** identified in this review, including:
  - o The range of pre-existing barriers, within-crisis barriers external to the humanitarian response, and barriers internal to the response, dependent on the context. The political economy should be central to this analysis;
  - o Programmes to provide AT alongside appropriate sensitization and awareness-raising, to tackle stigma and build demand for AT.

Donors, governments, multilateral agencies (including UNICEF) and NGOs have a role to play in all of these priority actions.

## Annex 1: Summary of studies with findings related to facilitators of AT provision

Excluded literature with no reference to AT provision (i.e., excluded literature with narrow medical focus, or focus on rehabilitation without AT provision.)

### Key

Blue: Primary sources (quantitative and qualitative studies)

Green: Secondary sources (reviews, systematic reviews)

Orange: Conceptual sources (e.g., commentary, lessons learnt, conference proceedings)

Red: Grey literature

	Author, year	Country (study location)	Evidence type /methodology	Group	Article objective (taken from abstract)	Findings
Data management	Landry et al. (2016)	Nepal	Commentary. Describes field experience in Nepal.	Adult	<i>This perspective article outlines lessons learned from Nepal that can be applied to future disasters to reduce overall disability-related outcomes and more fully integrate rehabilitation in preparation and planning.</i>	Standardized data collection protocols for EMTs improve long-term follow up for people with disabilities (1)
	Gosney (2016)	N/A	Literature review (book)	Adult	<i>Principles and practices for disaster medicine.</i>	Electronic tracking system for amputees (132)
	Ali et al. 2010	India	Survey of earthquake victims	Adult	<i>Morbidity Pattern and Impact of Rehabilitative Services in Earth Quake Victims of Kashmir, India.</i>	Database of recorded injuries crucial to ensuring long-term rehabilitation needs met (44)
	Zhang et al. (2013)	China	Longitudinal quasi-experimental study	Adult	<i>Evaluation of the effectiveness of a rehabilitation services programme following the 2008 Sichuan earthquake.</i>	Registration of professional volunteers in a database, to support rapid and targeted deployment of personnel (91)

## The Provision of Assistive Technology to Children with Disabilities in Humanitarian Settings

	Tataryn and Blanchet (2012)	Haiti	Literature review and interviews	All	<i>To assess the impact of the emergency response on the rehabilitation sector in Haiti, following the 2010 earthquake</i>	Development of a standard data collection form and corresponding database tool that humanitarian actors in the rehabilitation field could use in the initial emergency phase would reduce the amount of time spent by organizations developing their own forms, and would allow for compilation and comparison of data across agencies
Information provision	Benigno et al (2015)	Philippines	Rehabilitation needs assessment for people with disabilities	Adult	<i>This study describes the initial rehabilitation needs assessment and activities to increase rehabilitation services conducted in Leyte province after Haiyan Typhoon</i>	Publishing neutral information on services may have an impact on uptake of rehabilitation services and AT, and improve the disability referral system (83)
	De Witte et al. (2018)	N/A	Based on the experience of authors, an analysis of the existing literature and inputs from colleagues in the field.	N/A	<i>This is a position paper describing the elements of an international framework for assistive technology provision that could guide the development of policies, systems and service delivery procedures across the world.</i>	Agencies can provide simple and accessible information on low-cost simple ways to access or make AT products (142)
	Landry et al. (2016)	Nepal	Commentary. Describes field experience in Nepal.	N/A	<i>This perspective article outlines lessons learned from Nepal that can be applied to future disasters to reduce overall disability-related outcomes and more fully integrate rehabilitation in preparation and planning.</i>	Publishing a directory of services may have an impact on uptake of rehabilitation services and AT, and improve the disability referral system (1)
	Tanabe et al. (2013)	Kenya, Nepal, Uganda	Qualitative, participatory study in three sites	Adult Refugees	<i>Participatory research project with partners to explore the risks, needs, and barriers for refugees with disabilities to access SRH services</i>	Providing people with disabilities knowledge of their rights may help them access health services (157)
Approach to resourcing health	Sheppard and Landry (2016)	Nepal	Experiential account	N/A	<i>Lessons learnt from 2015 Nepal earthquake. Experiential account of physiotherapists present during the earthquake and participating in the post-disaster relief</i>	Deploying rehabilitation professionals alongside EMTs and as early as possible can improve long-term functioning by improving triage (16)



The Provision of Assistive Technology to Children with Disabilities in Humanitarian Settings

	Ali et al. 2010	India	Survey of earthquake victims	All	<i>Morbidity Pattern and Impact of Rehabilitative Services in Earth Quake Victims of Kashmir, India.</i>	Coordination between rehabilitation services and EMTs improves effectiveness of response for people with disabilities (44)
	Knowlton et al (2012)	N/A	Literature review and working group discussion	N/A	<i>Report of the 2011 Humanitarian Action Summit Surgical Working Group on Amputations Following Disasters or Conflict</i>	Surgical teams must be multidisciplinary and include access to and early ongoing coordination with personnel trained in rehabilitation.
	Gosney (2010)	N/A	Commentary	N/A	<i>Commentary characterizes the role of rehabilitation during the response stage of several recent large-scale natural disasters.</i>	Early rehabilitation post injury improves long-term functioning of people with disabilities (48)
	Zhang et al. (2013)	China	Longitudinal quasi-experimental study	Adult	<i>Evaluation of the effectiveness of a rehabilitation services programme following the 2008 Sichuan earthquake.</i>	Use of volunteer, external workers can lead to neglect of essential medical aftercare (91)
	Tataryn and Blanchet (2012)	Haiti	Literature review and interviews	All	<i>To assess the impact of the emergency response on the rehabilitation sector in Haiti, following the 2010 earthquake</i>	Development of a standard data collection form and corresponding database tool that humanitarian actors in the rehabilitation field could download and reproduce for use in the initial emergency phase after any disaster, would reduce the amount of time spent by organizations developing their own forms, and would allow for compilation and comparison of data across agencies
Use of networks/expertise	AT 2020 Hearing Aids Product Narrative	N/A	Literature review	N/A	<i>To develop strategic objectives for the market development of hearing aids in LMICs</i>	NGOS can sometimes negotiate pricing agreements, by procuring: 1) simple technologies, 2) at high volumes, and 3) confirming procurement is for humanitarian use only (159)
	Knowlton et al (2012)	N/A	Literature review and working group discussion	N/A	<i>Report of the 2011 Humanitarian Action Summit Surgical Working Group on Amputations Following Disasters or Conflict</i>	Close collaboration between NGOs, local authorities and professional bodies (91)

The Provision of Assistive Technology to Children with Disabilities in Humanitarian Settings

	Zhang et al. (2013)	China	Longitudinal quasi-experimental study	Adult	<i>Evaluation of the effectiveness of a rehabilitation services programme following the 2008 Sichuan earthquake.</i>	Coordination between local and emergency response agencies improves quality and sustainability of rehabilitation services(141).
Coordination	Landry et al. (2016)	Nepal	Commentary. Describes field experience in Nepal.	N/A	<i>This perspective article outlines lessons learned from Nepal that can be applied to future disasters to reduce overall disability-related outcomes and more fully integrate rehabilitation in preparation and planning.</i>	Having an explicit space for AT and rehabilitation designated within cluster systems (e.g. as a sub-cluster) is a factor in improved provision (1). Disability sub-clusters can be used to fill information gaps and share with all stakeholders.
	Knowlton et al (2012)	N/A	Literature review and working group discussion	N/A	<i>Report of the 2011 Humanitarian Action Summit Surgical Working Group on Amputations Following Disasters or Conflict</i>	A disability-specific sub-cluster co-led by an international organization and government can be a factor in improved coordination of services for people with disabilities (86)
Localization of services (CBR)	Zhang et al. (2013)	China	Longitudinal quasi-experimental study	Adult	<i>Evaluation of the effectiveness of a rehabilitation services programme following the 2008 Sichuan earthquake.</i>	IBR followed by CBR can improve outcomes for people with disabilities (91) by building accessible rehabilitation and AT services.
	Bongo et al. (2018)  (Note: study is not in humanitarian setting, but considers disaster resilience)	Zimbabwe	Semi-structured interviews, focus group discussions, key informant interviews and document analysis.	Adult	<i>Investigation of the effectiveness of the community-based rehabilitation (CBR) project in Zimbabwe to ascertain the positive district changes in the quality of life and disaster resilience of children with disability.</i>	CBR model's localized referral services can also provide a bridge between AT provision services and wider services – for example, education. Must be integrated into mainstream funding structures rather than donor-funded bolt on (60). Evidence of deliberate efforts to pool resources for provision of AT products.
Stockpiling	Landry et al. (2016)	Nepal	Commentary. Describes field experience in Nepal.	N/A	<i>This perspective article outlines lessons learned from Nepal that can be applied to future disasters to reduce overall disability-related outcomes and more fully integrate rehabilitation in preparation and planning.</i>	Stockpiling assistive devices can allow NGOs to distribute to those in need. However, protocols must be in place to agree prioritization according to need.

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