

Project:

Developing an integrated community mobilisation package to prevent childhood injuries in rural Bangladesh

Study Protocol

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Diabetic Association of Bangladesh



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SUMMARY

Injury and violence are major global killers of children, responsible for over 900,000 deaths in children and young people under the age of 18 years each year. Unintentional injuries (mainly road traffic injuries, drowning, poisonings, burns, and falls) account for almost 90% of these injuries and they are among the top three causes of death among children. Injuries account for 6% of total deaths among children under 5 years and are a threat to health in every country worldwide. About 90% of injury-related deaths occur in low- and middle-income countries. In Bangladesh, while childhood deaths due to infectious diseases have declined over the past decade, deaths due to injuries in the same age group are increasing. Drowning accounts for more than 90% of injury deaths (and more than 40% of overall death) in children under-5. The burden of injuries disproportionately affects rural and lower socio-economic groups in Bangladesh.

Most injuries and deaths from injuries are preventable and there is a wide range of interventions that have shown to be effective in preventing and reducing injuries in all countries. However, most of evidence on effectiveness of interventions for unintentional injuries is from high income settings and might not be easily transferable to LMICs. In addition, there is limited evidence for community-based interventions, in both high income and LMIC settings.

This study aims to develop and assess the feasibility and acceptability of an integrated package of community mobilisation interventions in preventing injuries among under 5 children in rural Bangladesh. The potential intervention will be an innovative integrated package of community mobilisation activities – combining the strengths of mass media in generating awareness, of household-visits in providing tailored practical advice, and of participatory learning and action groups (PLA) to catalyse social action using this awareness and advice to act on the community, household, and individual barriers to injury prevention. To design this package, a critical review of risk factors for childhood injuries and existing interventions in rural Bangladesh will be combined with a qualitative explorative study. In addition, feasibility and acceptability of the designed intervention will be assessed by a small-scale pilot.

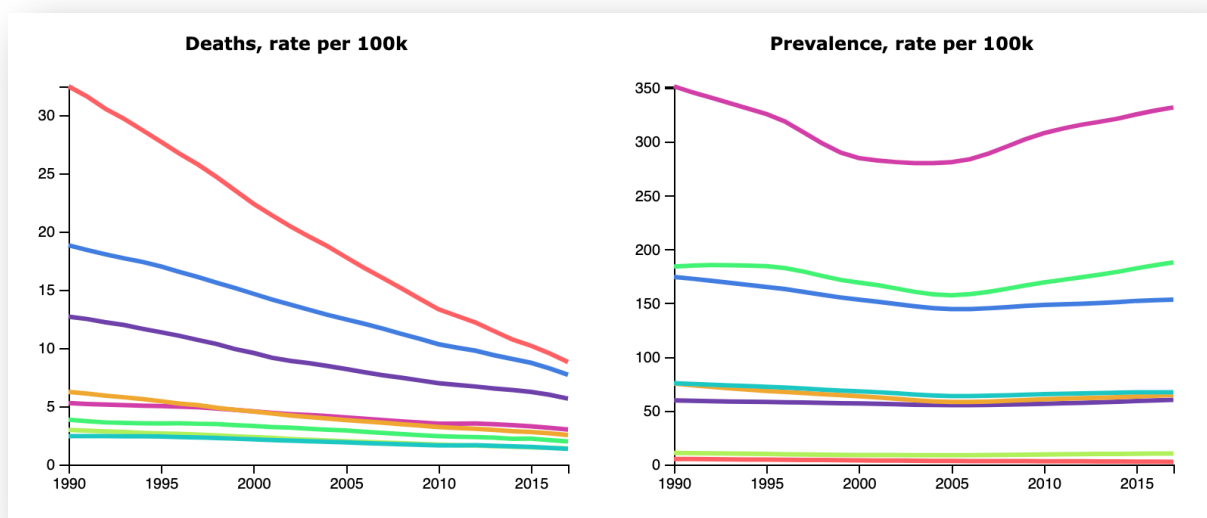
INTRODUCTION

Global Burden of Childhood Injury

Traditionally, injuries are defined as “damage to a person caused by an acute transfer of energy (mechanical, thermal, electrical, chemical, or radiation) or by the sudden absence of heat or oxygen”¹. Injuries can be divided into two broad categories based on intent: Intentional and unintentional. Unintentional injuries are defined as injuries that there is no evidence of predetermined intent to harm and commonly included road traffic injuries, drowning, poisonings, burns, cuts, falls and animal bite. Injuries are major global killers of children, responsible for nearly a million deaths each year in children and young people under the age of 18. Unintentional injuries account for almost 90% of these injuries and they are among the top three causes of death among children². In addition to mortalities from injuries, tens of millions of children each year are injured or disabled and may go on to suffer emotional and physical consequences for life². Globally, among under 5 children, injuries account for 6% of total deaths. About 90% of injury-related deaths occur in low- and middle-income countries².

Although the number of under 5 deaths due to injuries are decreasing globally, the number of injuries are increasing rapidly (Figure 1). Drowning and transport accidents are the main cause of unintentional injury deaths, and falls, exposure to mechanical forces, and transport accidents, are the major causes of injuries and disabilities among children under 5³.

Figure 1: Deaths and morbidities due to unintentional injuries among children under 5.



- Global, Both sexes, Under 5, Foreign body
- Global, Both sexes, Under 5, Falls
- Global, Both sexes, Under 5, Drowning
- Global, Both sexes, Under 5, Fire, heat, and hot substances
- Global, Both sexes, Under 5, Poisonings
- Global, Both sexes, Under 5, Exposure to mechanical forces
- Global, Both sexes, Under 5, Animal contact
- Global, Both sexes, Under 5, Transport injuries

Risk factors for unintentional childhood injuries (UCIs)

Research has identified environmental and social risk factors for UCIs, many of which are common across different types of injuries ^{2,4,5}. These factors can be categorised into five overlapping groups:

- 1- Socioeconomic and socio-demographic factors such as poverty, social deprivation, maternal education, maternal age, household size, and rurality and remoteness.
- 2- Child-specific risk factors. Gender, age and physical and cognitive developmental stage of children affect rate of UCIs. Boys are generally more at risk of fatal and non-fatal injuries compared to girls across most injuries. (Table 1).
- 3- Parent or primary caregivers related factors. Lack of/inadequate supervision and lack of awareness of UCI risks among caregivers are among the factors reported for all childhood injuries. These factors are often interrelated to socio-economic factors such as being a single parent or being a working parent ².
- 4- Environmental factors. These factors differ by type of injury and are related to hazards at home or within the community or wider social environment. Examples of environmental factors are unprotected water hazards, unsafe stoves/ no separation between cooking area and other areas, poor road design, and lack of alcohol laws. Inadequate access to good quality medical care is also one important factor contributing to mortality or disability due to injuries. Again, most environmental factors are interrelated to poverty and other socio-economic factors ².

The tool most commonly used for identifying risk factors and developing prevention strategies for injury prevention is the Haddon Matrix. The tool, which applies principles of public health to injury prevention, combines phases of injuries (pre-event, event, and post-event) with influencing factors related to host, agent/vehicle, and environment (both physical and social) ^{6,7}. However, it has been criticised for not providing a systematic plan of action ⁸ or less emphasise on the behavioural factors ⁹.

Table 1: Children development stage and risk of injuries*

Age group	Developmental characteristics	Link to injury area
Birth to 1 year	<ul style="list-style-type: none"> ● Reflexive & cannot control body movements ● Reaches & mouths objects & imitates others ● Becomes mobile, but with poor balance ● Has limited ability to obey verbal commands 	<ul style="list-style-type: none"> ● Can wiggle off tables and other surfaces; can get head or body stuck ● Can choke, poison, cut, bruise, scald themselves; can get electric shock ● Can fall, reach dangerous objects that can choke, cut, bruise, scald, shock ● Cannot rely on verbal commands to avoid accidents

1 to 3 years old	<ul style="list-style-type: none"> Balance improves, learns to climb and run Asserts independence Can play alone or with others & engages in make believe play Can follow only simple directions 	<ul style="list-style-type: none"> Can fall into unprotected accumulations of water, trip, reach dangerous objects that can choke, cut, bruise, scald, shock Can attempt dangerous activities that are beyond their skill level Cannot leave unsupervised Cannot rely only on verbal commands or instruction to avoid accidents
3 to 5 years old	<ul style="list-style-type: none"> Increased mobility, climbing, running, more outdoor play Asserts independence Curious, asks many questions Plays interactively with others, enjoys make believe Improved cognitive & language skills Begins to understand relationships between things 	<ul style="list-style-type: none"> Can fall off playground equipment or other surface; can get head or body stuck Tries to do more dangerous activities independently and during play with others, such as climbing, running (e.g., into street) Can begin to understand danger and respond to warnings or commands; can learn routines (e.g., buckling up) Caregivers may reduce supervision inappropriately (e.g. both working in fields)

*Source: ¹⁰

Interventions for prevention of UCIs

Though the aetiologies behind different injuries varies, most injuries can be prevented and there is a broad range of strategies based on sound scientific evidence that have been shown to be effective at reducing unintentional injuries ^{1 2 4 11}. These interventions/strategies have used different approaches which mainly following “three E’s” of injury prevention: education, enforcement and engineering (modification), and in the Haddon matrix as a framework ^{1 2}.

A recent systematic review by Vecino-Ortiz et al (2018) identified 11 interventions that can be effective in reducing injury mortality in low and middle income countries (LMICs): e.g. for road-traffic accidents – speed enforcement and drink-driving enforcement; for drowning – formal swimming lessons for children younger than 14 years and the use of crèches to supervise under 5 children ¹². The review identified numerous other interventions for poisoning, burns, and falls.

Furthermore, recently the third edition of Disease Control Priorities (DCP3) recommend a list of interventions for unintentional injuries with good evidence in high income or LMICs ^{4 5}. Table 3 presents a modified list for the recommended interventions for each injury type.

Overall, review of the evidence shows that: a) the evidence base for community-based interventions, in both high income and LMIC settings, is scarce; b) most of evidence on effectiveness of interventions (and recommended strategies) for unintentional injuries, in particular non-transport injuries, is from high income settings and might not be easily transferable to LMICs; and c) the majority of interventions focus on either all age groups or older children and adults and may not appropriate for young children.

Table 3: Effective interventions for Cause-Specific unintentional Injuries, in HICs and LMICs*

Cause-specific injury	Age group	HICs	LMICs
Falls	Children	Home safety interventions providing free, low-cost, or subsidized safety equipment	-

Drowning	Children	Legislation and enforcement of swimming pool fencing Provision of swimming lessons Legislation and enforcement of Personal Flotation Device use for recreational boaters	Parental or other adult supervision and swimming lessons
Burns	All ages	Installation and maintenance of smoke detectors Education, legislation, and enforcement to regulate the temperature of household taps	Improvements in stove design
Poisoning	Children	Home safety education, with the provision of safety equipment (Kendrick and others 2013)	Community-based educational interventions Child-resistant containers
Transport injuries	All ages	Providing and encouraging use of alternative forms of mass transportation Increasing the visibility of pedestrians and cyclists Supervising children walking to school Separating different types of road users Reducing average speeds through traffic calming measures Setting and enforcing speed limits appropriate to the function of roads Setting and enforcing blood alcohol concentration limits Setting and enforcing the use of seat belts for all motor vehicle occupants Setting and enforcing motorcycle helmet use Encouraging helmet use among child bicycle riders	Same interventions.

Source: ^{4 5}

Childhood injuries in Bangladesh

Based on the latest population survey conducted in Bangladesh in 2013, fatal and non-fatal injury rates were highest in children under 5 years of age. Drowning accounts for more than 90% of injury deaths (and more than 40% of overall death) in children under 5 ^{13 14}. The burden of injuries disproportionately affects rural and lower socio-economic groups in Bangladesh ¹⁴.

The five main causes of non-fatal unintentional injuries among children under 5 in 2017 are transport, exposure to mechanical forces (mainly sharp objects, machine and adverse medical treatment), falls and animal contact (venomous and non-venomous) ³(Figure 2). Boys had more fatal injuries than girls

across most injuries, except for burns and fall where incidence among boys was only slightly higher (Figure 3). Non-fatal injuries were higher among boys than girls, except for burns, poisonings and animal contact (Figure 4).

Figure 2: Deaths and morbidities due to different injury cause among children under 5 in Bangladesh

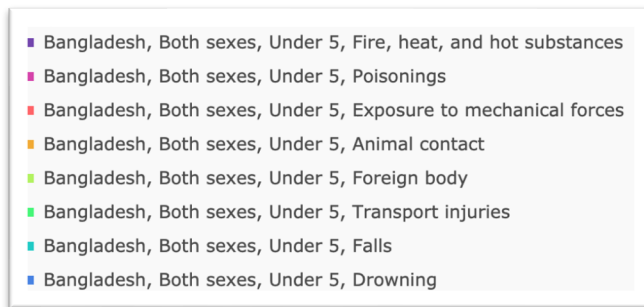
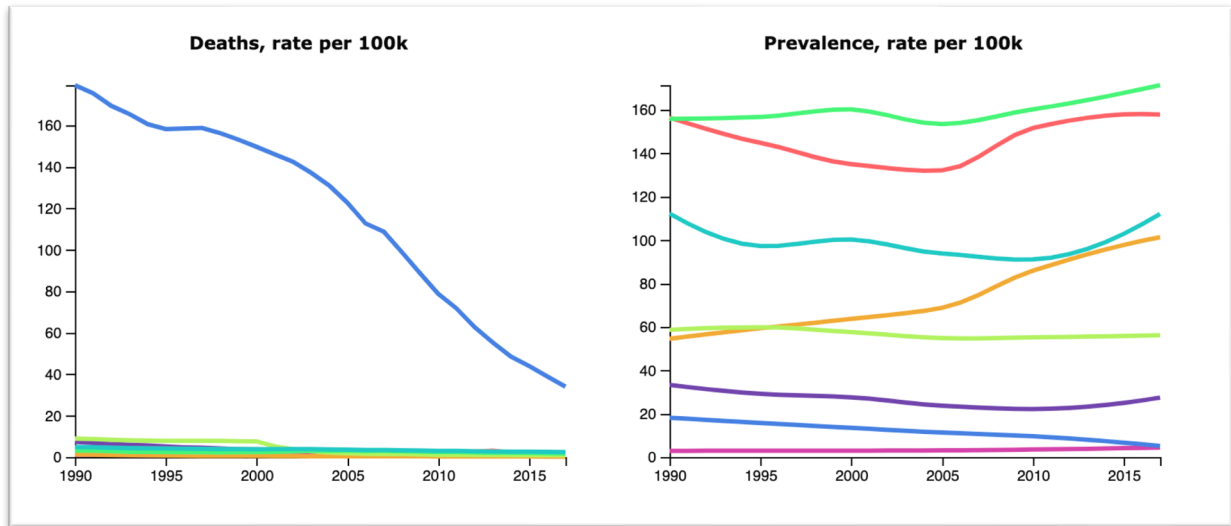


Figure 3: Deaths due to unintentional injuries based on sex of children

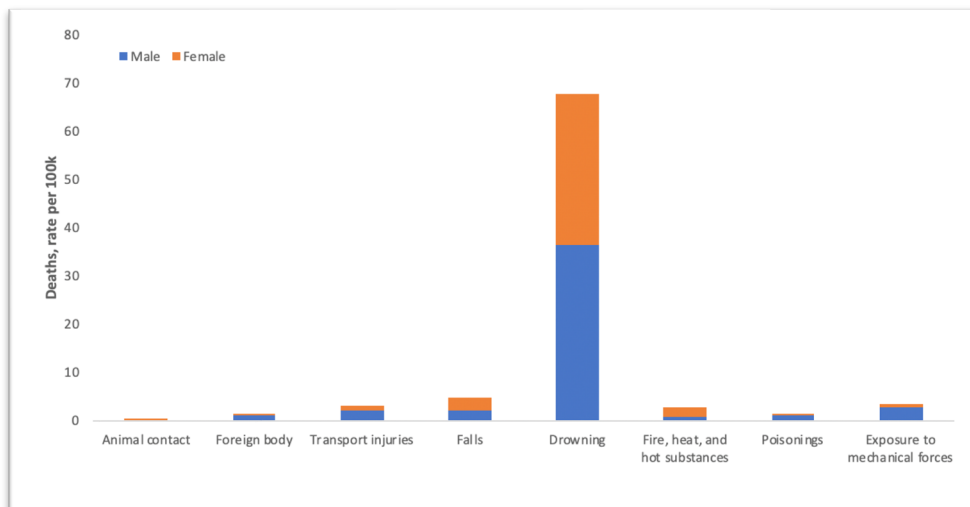
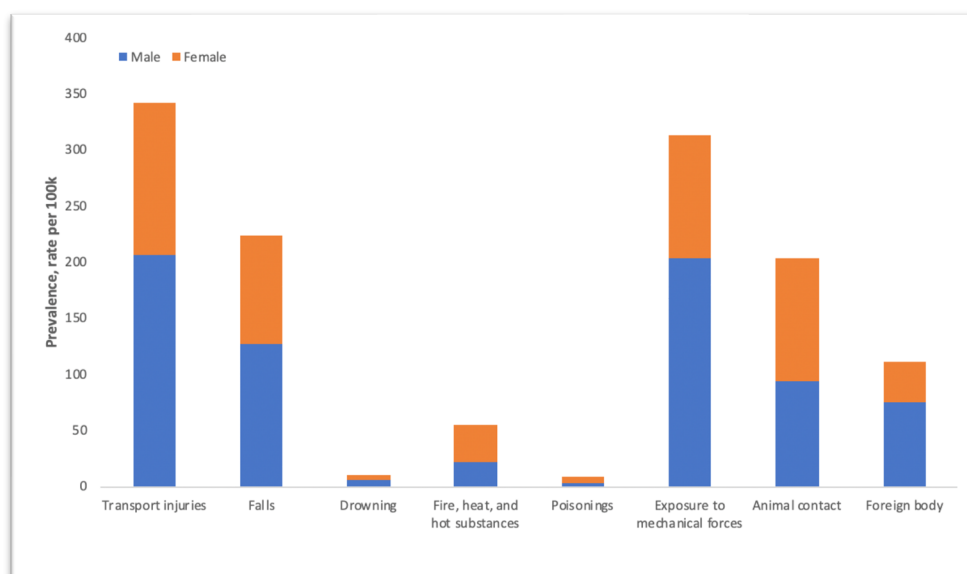


Figure 4: Prevalence of unintentional injuries based on sex of children



Risk factors in the context of rural Bangladesh

Most research on injuries in Bangladesh has focused on drowning and its risk factors^{13 15-23}, which is understandable considering the high burden of drowning in the country, following by burn^{24-28 26 29 30}. Fewer studies have focused on other injuries such as falls³¹, traffic injuries³² and cuts and injuries due to blunt objects³³. Table 2 summarise the main risk factors for different UCIs reported by the studies conducted in Bangladesh. These risk factors are similar to those reported in other LMICs^{4 5}.

Overall, being male/boy, from a low socio-economic family, live in rural area and inadequate supervision were the common risk factors reported by the studies in Bangladesh.

Table 2: Summary of risk factors for UCIs reported by the studies in Bangladesh

Type of injury	Child related factors	Caregivers related factors	Environmental related factors	
			Physical	Socio-cultural
Drowning	Aged 1-4 ^{13 14 18 23 29} Male/boy ^{20 21 23} Cognitive and motor development of young children ¹⁵	Less educated caregivers ²⁰ Inadequate supervision ³⁴ ¹⁸ . Borse et al (2011), reported that inadequate supervision was associated with 70% of drowning-related deaths among children in Bangladesh ¹⁸ . A similar conclusion was reported by Khatlani et al (2017) for all UCIs ³⁵ . Time of the day (for example, between 9 AM and 3 PM ²² or 11 AM and 2	Presence of unprotected waters such as ditches, ponds and canals around the household ^{15 16 18 21} Rainy/monsoon season ^{15 18} Harvest season ¹⁵ , when caregivers working in field	Children from lower socio-economic households ^{14 36} Rural children ^{23 29} Households with four or more children ²³ Inadequate access to care during or after fatal injuries rural areas ^{37 34} Lack of skills and training in rescue and resuscitation by caregivers or bystanders ³⁷

		<p>PM³⁴ or morning time¹⁸) when younger children are often supervised by older siblings as parents are working inside or outside the home.</p> <p>Lack of knowledge or awareness of caregivers from risks of injuries³⁴</p> <p>Findings from few qualitative research reported that majority of caregivers of fatal incidence believed that that a supernatural power was responsible for the death¹⁵ 18</p>		<p>Studies reported that in very few cases resuscitation was performed and in majority of cases inappropriate practices are performed by victim's family or community members for resuscitation¹⁸</p> <p>Borse et al (2011) found that child's gender has an influence on the type of care sought after a drowning event; boys received medical care while girls were more likely to be treated using traditional methods¹⁸.</p>
Burn	<p>Children aged 1-4^{26 4} 30</p> <p>Mostly Male/boy²⁵⁻²⁷</p>	<p>Inadequate supervision²⁵</p> <p>Mashreky et al (2008), reported that around half of non-fatal burn injuries occurred between 9 a.m. and 3 p.m.²⁶, when caregivers were busy with household chores.</p>	<p>Majority of injuries occur in the kitchen or cooking area and due to unsafe kitchen environment/traditional open earthen stove (Choola/Chula), using biofuel (wood, leaf, cow dung), as main cause of flame, and using traditional kerosene lamps without any shade (kupi bati), as well as cooking utensils.²⁵⁻²⁹</p> <p>Flame (caused by cooking fires and Kerosene lamp flame, especially among infants and 1-4 years old children) following by hot liquid/scold (e.g., hot water/oil for cooking) are leading cause of burn.^{26 28 29}</p> <p>Burns injuries mainly occur in winter³⁰.</p>	<p>Rural children (four-time higher incidence than urban)^{26 29}</p> <p>Children from lower SES families^{28 36}</p> <p>Some qualitative studies reported misperceptions and wrong treatment of burns, and a reliance on traditional healers or unskilled staff for care after injury^{25 30}.</p> <p>Lack of knowledge, economic barriers and lack of transport are mentioned as reasons for not seeking care at public facilities³⁰.</p>
Fall	<p>Children aged 1-4^{38 29}</p> <p>Mainly male/boys²⁹ 38</p>	<p>Lack of parental supervision^{39 38}</p> <p>Low level of awareness about injury³⁹</p>	<p>Mainly occur at home and its premises/hazardous environment at home^{29 31}</p> <p>In a study by Chowdhury et al (2008) reported that more than half of all childhood fall incidence occurred from higher level, and a tree</p>	<p>Children from lower SES families^{28 36}</p> <p>Rural children²⁹</p>

			was the most common site, followed by furniture ⁴⁰ .	
Road traffic injuries	Mainly occur in children older than 5 years old ²⁹ Male/boy ²⁹			Children from lower SES families ^{28 36} Rural children ²⁹
Cuts and injuries due to blunt objects	Male/boy ³³ Mainly occur in children older than 5 years old ²⁹			Children from lower SES families ^{28 36} Rural children ²⁹
Poisoning	Children under 5 ^{29 33}		Unsafe storage of poisons in places at home ²⁹ In rural area, universal exposure of infants to agricultural chemicals stored at home ²⁹ Mainly caused by insecticides followed by pesticides and detergent ^{29 33}	Children from lower SES families ^{28 36} Rural children ²⁹

What we can learn from qualitative studies on risk factors and strategies for prevention of UCIs

There are a number of qualitative explorative studies, which mainly focused on drowning and burn, have explored communities' perceptions of the risk factors for UCIs and prevention strategies that are potentially acceptable and feasible. These studies reported similar risk factors as shown in Table 2. The strategies proposed by the community members mainly target supervision and physical environment risk factors. These strategies are summarised in Table 3.

Table 3: Strategies proposed by the community members for preventing UCIs

Suggested strategies/approaches	Drowning	Burn
Education/awareness raising and skill development	Educating the rural community on childcare and supervision (including all adults in family) ¹⁸ Teaching swimming to children ¹⁵ Developing and disseminating culturally appropriate messages to change misconceptions of risk perception (e.g. the perceived low risk related to low level water) or inappropriate resuscitation practices ¹⁵ .	Community education programme on changing misperceptions and wrong treatment of burns, a reliance on traditional healers or unskilled staff ³⁰ . School education about first-aid for burn injuries, as well as other common injuries ³⁰ Organising awareness raising campaigns using slogans urging communities to turn off burners or other kitchen stoves when they are not being used ²⁵

	<p>Examples of children rescued by a parent need to be shared in communities¹⁵.</p> <p>Government should ³⁴:</p> <ul style="list-style-type: none"> - Use mass media awareness campaigns, such as mobile SMS, radio, television and advertisements on billboards to prevent childhood drowning - Hold monthly meetings with parents about childhood drowning - Provide swimming instructors for each village and - ensure that ponds were fenced in. <p>Religious organisations and NGOs should host conferences to increase public awareness regarding the dangers of childhood drowning ³⁴.</p>	<p>Awareness raising activities by government agencies through various media²⁵</p> <p>Wider community awareness campaign (via mass media) in rural settings to improve knowledge about burn injuries and the importance of immediate and correct treatment³⁰.</p>
Environmental modifications	<p>Door barrier, playpen were considered the measures most acceptable and feasible¹⁵</p> <p>Using door barrier/guards and playpen is more effective if accompanied by adequate adult supervision¹⁵</p> <p>Government should ensure that ditches were filled in and that barriers/fence should be erected around the ponds or ditches to stop children from entering the area³⁴.</p>	<p>Community members should dispose of hot ashes away from living spaces, so that children can be kept away from these areas²⁵.</p> <p>Furnaces for parboiling rice or boiling cane juice should be located far away from dwellings²⁵.</p> <p>Government health workers could check homes and surroundings for risk areas for burn injuries²⁵.</p> <p>Electricity service providers should check electricity lines at regular intervals²⁵</p>
Medical care	<p>Community-based resuscitation techniques and emergency medical systems are needed to improve post immersion recovery of the child¹⁸</p> <p>Immediate rescue and treatment are crucial in minimising disability and improving survival¹⁸.</p>	<p>School education about first-aid for burn injuries, as well as other common injuries³⁰</p>
Legislation		<p>Impose strict laws on buying and selling acids, fire-crackers etc²⁵.</p>

Community-based interventions implemented to prevent UCIs in Bangladesh

Few community-based interventions to prevent childhood injuries have been developed and implemented in Bangladesh. Nearly all these interventions have focused on drowning prevention. Below we have briefly described two large scale and two small scale pilot interventions:

1- Child Injuries through Social-intervention and Education (PRECISE)^{17 41}. PRECISE was a quasi-experimental community trial which was implemented between 2006 and 2010 in rural Bangladesh (four rural upazilas and one urban pilot,) targeting children under 18 years. The programme developed

and implemented several injury prevention packages applicable to the *home*, the *school*, and *within communities*.

Home safety component focused on removal of physical hazards in the home environment, supervision of small children, and recognition of responsibilities as well as risks among caregivers. During this programme, a trained community member (either paid volunteers called community injury prevention promoters or community health workers), called Community Injury Prevention Promoters, visited homes to identify the injury hazards in homes and counsel households to remove the hazards using flip charts.

School safety component aimed to increase knowledge and awareness of the students and teachers on the potential injury hazards, and to identify the potential hazards in and around schools for necessary interventions. As part of this programme, injury prevention textbooks were introduced in the education programme and teachers were trained to recognize and remove/reduce injury hazards in and around school.

Community safety components included two main programmes called *Anchal* (or community/village crèche or child care centre), which operated from 9 AM to 1 PM daily and focused on children 1 to 5 years old, and *SwimSafe*, which consisted of basic swimming, water safety, and safe rescue skills for children aged 4 to 12 years. Anchal was expected to reduce drowning and other injuries owing to increased supervision, as majority of under 5 deaths and injuries occur between 9 AM and 3 PM when children are often supervised by older siblings while parents work inside or outside the home.

In addition to Anchal and SwimSafe, the programme also included other components such as community advocacy (by creating Village Injury Prevention Committees), a first response system, disaster preparedness, and community education and awareness through different media such as social autopsy meetings (i.e., meetings held after an injury death with the deceased family, neighbours and community leaders to elicit the social errors that caused the death and to identify appropriate preventive measures at the community), video shows and interactive popular theatre.

Figure 4 shows the conceptual framework for PRECISE. The effectiveness of the programme evaluated using baseline and endline survey on injury mortality, morbidity and mothers/carers' KAP, alongside an inbuilt Injury Surveillance System. The programme reduced overall injury deaths in children 0-17 years old by 28%, drowning in children 1-4 years around 44%, and injury hospitalisation in 0-17 years old children about 29%. The programme also increased students' knowledge on injury prevention.

What explains the observed effects in under 5 children? Almost all the impact of injury mortality reduction in PRECISE was due to the substantial reductions in under 5 drowning. This was mainly mediated by increased supervision (through anchal/creche) and water hazard isolation. This happened in the home of the child as well as through anchal/creche, a safe haven for the child during the peak work hours for the child's mother. However, the child also benefited from increased safety at home in the hours after anchal as a result of the linkage of the mother at home and the anchal mother. This interaction seems to have been mediated by the frequent meetings with home mothers at the site of the anchal as well as the frequent home visits from the anchal mother to the child's home. Same mechanisms were responsible for reduction in under 5 injury morbidities such as falls, burns and cuts.

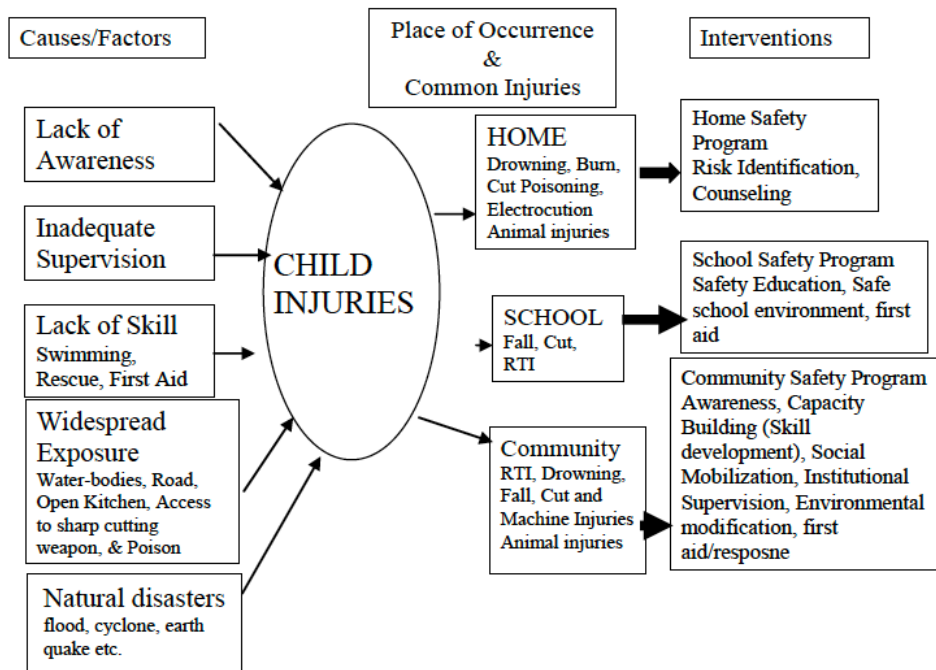
The relationships between other intervention components (such as courtyard meetings, social autopsy, interactive popular Theatre, video docu-drama) and the injury incidence reductions were less clear.

In addition, findings from process evaluation indicated that Anchal brought some social changes to the community through: 1) reducing women workload significantly (so they don't have to clash with the husbands when there is busy schedule for both the spouses), 2) they were able to engage in income generating activities (such as helping husband on field), 3) allowed mothers to have some time for relaxation and, 4) realising role of anchal in early childhood education and development of under 5 children.

Findings from process evaluation provided following recommendations in order to improve future interventions:

- More training on counseling for Community Injury Prevention Promoters and particularly for Anchal Mothers is needed to make them capable of motivating people. Selection process for these people is important too.
- There should more focus on group approaches on Home Safety issues where peer pressure could work to make own home safe, instead of single or doorsteps services.
- Develop strategy for Home Safety programme to target male members of the families. Mothers argued that this is a barrier to change injury risks at home.
- More posters on injury messages should be developed to make people understand the consequences of injuries.
- Mothers can be given injury books for more understanding.
- The techniques of counseling need innovation as people are not interested to hear about the same issues regularly.
- Religious leader or particularly Imam must be involved in the programme and they could be provided counseling training so that they can educate community through their speeches and preaching session.
- Revise home safety messages like Fencing or making earthen wall, pond fencing considering the geographical and socio-economic constraints. In reality, fencing involved complexities such as land ownership, limited land and oven fencing, multiple oven for multiple use and varied seasons, plenty of ditches and lack of land use planning.
- More involvement of local Government institutions is needed in the entire programme.

Figure 4: PRECISE conceptual framework.



2- Saving of Children’s Lives from Drowning (SoLiD) ⁴²⁻⁴⁴. SoLiD was a large-scale implementation study to prevent under 5 drowning in rural Bangladesh. This study, carried out during 2012-2016, aimed to assess effectiveness of large-scale implementation of three drowning prevention interventions. Intervention components in SoLiD were similar to the PRECISE programme but were implemented at scale. The intervention components were: a creche-only, a playpen-only, and a creche plus playpen. Each intervention combined with the setting up injury prevention committees (at union and village levels) to provide community education on injury prevention. The interventions were implemented in seven rural subdistricts of Bangladesh (Matlab North, Matlab South, Daudkandi, Chandpur Sadar, Raiganj, Sherpur Sadar, and Manohardi), covering a population of around 1.3 million people, and with a high incidence of drowning.

The study had two goals: to estimate the change in drowning deaths before and after intervention, and to determine which components of the intervention (i.e. playpen-only, creche-only or creche plus playpen) were the most effective. The primary goal was evaluated using a pre-post design comparing fatal drowning outcomes for children overall and by age group and by study area between pre-intervention and post-intervention periods. The secondary goal was evaluated by comparing cumulative incidence of drowning of the children under the different intervention arm with cumulative incidence of drowning of their older siblings (or younger versions of the treated children) during the 12 months prior to the baseline survey. This was done because of the non-randomised nature of the study and that caregivers self-selected into different treatment categories ⁴⁴.

The results showed that only creches were effective for preventing childhood drowning. The results also showed that there was no mortality reduction with playpen use (alone or in combination), and this group may actually have had a higher risk of drowning (maybe due to caregivers’ risk compensation or false sense of security because of the presence of the playpen and other project activities in their communities, as authors justified).

What explain the observed effects? The authors explain that although both creche and playpen involved community engagement through the union and village committees, the implementation of the crèche required more active involvement of the village committees at various phases: creating the crèches, recruiting crèche mothers and children, and providing support to the day-to-day running of the crèches. Hence, the committees created a platform for effective delivery of crèche services through social action.

In addition, they reported a very poor compliance with the use of the playpens (around 26% only used it). Most of those not used their playpen, reported that the children do not like to stay inside playpen. Caregivers preferred the creche over the playpen because of its additional benefits, especially early childhood learning and opportunity for caregivers (mainly women) to earn supplemental income outside of the home⁴⁴.

3- Child supervision practices for drowning prevention¹⁹. This was a pilot study of three potential intervention strategies/packages to prevent childhood drowning in Matlab, between February 2004 and August 2006. Three intervention packages included (1) educational drowning prevention messages, (2) educational messages and door barriers, and (3) educational messages and playpens (a rigid four-sided enclosure with slats and a firm base). These interventions were piloted in six villages to assess their community acceptability. The evaluation of this pilot study showed that direct child supervision increased and that the majority of households used one of the supervision tools (i.e., door barrier or playpen). The Playpen tool was accepted and used the most by the households.

4- MOBILE COACH⁴⁵. It is a small efficacy cRCT, implemented in 2015 in Rajshahi district (10 villages), to test efficacy of a fully mobile-phone based intervention for the prevention of childhood drowning among parents with children under 5 (study population). The aim of this intervention was to increase knowledge, safety awareness, safety behaviour and practices, and reduce the incidence of childhood drowning through weekly SMS messages, images, videos and audio messages. During its six-month implementation period, participants received one SMS and image per week, and a monthly audio and video message for the assessment of knowledge and awareness and practice about childhood drowning. All SMSs, videos, audio messages and images were designed and recorded prior to the implementation. All participants received brief training on use of the SMS and image intervention from the study assistants.

Overall, the intervention is not explained clearly, and it is not clear how coaching was done if all materials were pre-recorded. We could not find any published findings from MOBILE COACH.

There are few existing and ongoing programmes such as BASS (Bangladesh anchal and swimsafe)⁴⁶ or BHASA⁴⁷ that mainly have implemented Anchals (community crèche), and SwimSafe programmes (same components as PRECISE) in few districts in Bangladesh. There is no published evaluation on these interventions.

Summarising evidence in Bangladesh and highlighting evidence Gap

Preliminary review of the community-based interventions implemented in Bangladesh, the following observations can be made:

- The interventions mainly focus on drowning, with little evidence for other unintentional injuries.
- Generally a combination of intervention components such as creche, playpen, community awareness campaigns among others, have been implemented, but evidence shows that creches are the only acceptable, effective, cost-effective and potentially scalable solution for preventing drowning mortalities and incidence of other UCIs.
- There is mixed evidence for community acceptability (and effectiveness) of other prevention strategies, such as playpen and door barriers. However, limited explorative work have been conducted on why uptake of these interventions is limited and how to improve their uptake.
- Process evaluation from PRECISE project (the only study conducted a process evaluation) suggested that future interventions need to adopt a *group-based approach*, involve *fathers/male member of households*, and emphasise on *mass campaign*, involve *religious leaders* in the company (as influencers), as well as more involvement of *local Government* institutions. It also points to need to a participatory development of safety messages that are acceptable and feasible to implement.
- The interventions tried to involve communities and build community ownership and potentially, sustainability, through establishing union and village committees. Evidence suggests that the PLA group approach has the potential to strengthen this process and promote sustainability.

AIM AND OBJECTIVES OF THIS STUDY

The overall aim of our study is to develop and test the feasibility, acceptability and accessibility of an integrated package of community mobilisation interventions to prevent injuries among children under 5 in rural Bangladesh. Specifically, the study will address the following objectives:

- a) Conduct a scoping review of the evidence on epidemiology of childhood injuries and associated risk factors in rural Bangladesh.
- b) Conduct a realist scoping review of the interventions/programmes targeting unintentional childhood injuries in Bangladesh, as well as similar settings to Bangladesh
- c) Conduct formative qualitative research in communities to inform the development of the intervention.
- d) Co-produce an integrated community mobilisation package to prevent childhood injuries in rural Bangladesh, in collaboration with local community representatives, injury/community intervention experts and policy makers, and co-design a theory of change.
- e) Explore the feasibility, acceptability and accessibility of the intervention package, with a view to confirming criteria for progression to a trial in the next phase.

POTENTIAL INTERVENTION

The potential intervention will be an innovative integrated package of community mobilisation activities – combining the strengths of mass media in generating awareness, of household-visits in providing tailored practical advice, and of participatory learning and action groups (PLA) to catalyse social action using this awareness and advice to act on the community, household, and individual barriers to injury prevention. The package is likely to comprise a combination of:

1. Mass-media health promotion campaigns to raise the awareness of caregivers in relation to childhood injuries, their risk factors and prevention strategies. We will explore the use of radio, mHealth messaging (text/picture/voice/video), and poster campaigns based on our literature review and the preferences of communities.
2. PLA groups facilitated through a community action cycle. The cycle will have four types of meetings. First, ‘group formation meetings’ – at the beginning of the cycle, for groups to form, develop ground rules and elect a committee. Second, ‘injury’ meetings – in each meeting the groups will select and cover a different type of unintentional injury that is prevalent in Bangladesh and work through four questions: a) is this injury common?; b) what causes this injury and what practices can help to prevent the injury from happening or manage it if it has already happened?; c) what are the barriers to performing these practices?; and d) what locally feasible solutions can help to overcome these barriers?. At the end of each meeting the groups will be guided to develop an action plan to deliver their solutions and benefit the whole community. Third, ‘community meetings’ – regular meetings that bring the whole community together so that group members can share progress and gain support. And finally, ‘evaluation meetings’ – where the groups can self-evaluate the success of their solutions and plan for the future.
3. Design and piloting of a tool to be used by PLA group members during household visits to enable the systematic identification of child injury hazards and provision of tailored practical advice and support on prevention strategies.

A PLA approach that supports communities to design local solutions has not previously been applied to UCI injuries. However, it has successfully engaged communities to lead the design and implementation of local health solutions. For example, when applied to maternal and newborn survival, it has been highly effective and cost-effective, including in Bangladesh – reducing maternal mortality by 49% and newborn mortality by 33%⁴⁸. In addition, it is equitable⁴⁹, potentially sustainable⁵⁰ and scalable⁵¹. It has been awarded a WHO global recommendation⁵². Subsequent application to non-communicable disease risk and diabetes shows similar positive impacts⁵³.

STUDY SETTING

The project site will be in the Faridpur district which has a population of over 1.7 million people in an area of just over 2000 square kilometres and is situated on the banks of the Padma river. The district has a mainly agricultural based economy, and is divided into nine upazillas. Overall literacy rate in Faridpur is 40.9% – male 44.6%, female 37%⁵⁴.

As in the rest of the country, primary health care in Faridpur, is provided at the village level through Community Clinics and at union level through a Health and Family Welfare Centre. In- and out-patient services are provided at sub-district (upazila) health complexes and hospitals, and tertiary care is provided at district hospitals and medical college hospitals⁵⁵.

Based on a verbal autopsy survey conducted in Faridpur and two other rural districts between 2009 and 2011, drowning was of the major cause of under 5 mortality with around 20% of total deaths⁵⁶

PLAN OF ACTION

The study aim will be achieved through qualitative formative research, implementation research and engagement with local and national stakeholders, which is informed by the Six Steps in Quality Intervention Development (6SQuID) approach⁵⁷. Specifically, the following seven activities will be conducted:

Step 1 – Literature review

Step 2 – Seeking stakeholders' and Technical Advisory Group (TAG) advice

Step 3 – Formative research

Step 4 – Co-produce the intervention package

Step 5 – Implementation research/Pilot the designed intervention

Step 6- Implementation research evaluation

Step 7 – Dissemination

Step 1 – Literature review

As part of this step, we will conduct two reviews: a scoping review of the epidemiology and risk factors for UCIs in Bangladesh and a realist review of the interventions for UCIs in Bangladesh and similar settings to Bangladesh.

We will conduct a scoping review of published evidence on epidemiology of unintentional injuries among under 5 children and their major risk factors in rural Bangladesh. The purpose of the review is to identify the main causes of UCIs, factors influencing the incidence of injuries (eg. socio-ecological factors), and potential modifiable causes/factors that can be addressed through interventions. The review will include both grey and published literature; both epidemiological and explorative qualitative studies. The detailed protocol for the scoping review is provided as Annex.

We will also conduct a realist scoping review to 1) identify existing interventions/programmes implemented to address childhood unintentional injuries (in all age groups or specifically focus on younger children) in Bangladesh and similar settings to Bangladesh, 2) to describe the main characteristics of the interventions/programmes (such as targeted UCIs, evaluation design, intervention components, delivery approach/platform, underlying theory/hypothesis, implementation setting/context, target population/participants, and outcomes) and, 3) identify potential causal mechanisms that can explain the observed outcomes. A draft protocol for the realist review is provided as Annex.

The findings from these reviews will inform our formative research (step 3), theory of change and intervention package design (step 4).

Step 2 – Seeking stakeholders' and Technical Advisory Group (TAG) advice

We aim to actively involve main stakeholders' groups including local community members and influencers (religious and community leaders), injury/community intervention experts, representatives from local NGOs/CSOs, community health providers, and policymakers throughout our study. This step will be the first point of contact with stakeholders, and during this step we will present to them: 1) the main health issue investigated by this study using the existing evidence collated in step 1, 2) our objectives and action plans, and 3) provide an opportunity to hear their views and experience.

Furthermore, in this step we will present our research plan to the project TAG, who are a combination of local and international experts in injury prevention, community and PLA experts and national stakeholders, to collect their thoughts and advice.

This step will help us to capture any evidence which has not been identified in step 1 and more importantly, to finalise the study objectives and action plans.

Step 3 – Formative research

Formative research will use a socio-ecological framework to explore the drivers of under 5 injuries at the personal, household, community and policy level, and to analyse the barriers and facilitators to preventing injuries (at home and within communities) in the particular study context.

Optimal plan (planned pre-COVID-19)

We will conduct qualitative research, purposively sampling community members, health workers, caregivers, and caregivers who have experienced a childhood injury to describe childcare practices, explore definitions of childhood injury, explore causes and responses to the main causes of injury. We will collect data in two rural areas of Faridpur, one that is near a body of water or pond, and one that is far from a body of water because prioritisation of causes of injury may differ in these locations. Within each community we will conduct one focus group discussion with men and one with women to describe and explore community norms around childhood injury and community norms around childcare of children under five (n = 2). At the end of each focus group we will discuss which injuries are the most salient and ask participants to help us locate eight caregivers (n=8) who have experienced these injuries in children under 5 in the past five years. We will then conduct semi-structured interviews with these caregivers. If possible, we will ask the participant to show us the place where the injury happened. If we have a gender imbalance of caregivers, we will conduct 4 semi-structured interviews (n=4) with fathers of these children. We will conduct unstructured observation in two 'average' households in each community with at least one child under five to discuss and observe childcare practices with caregivers (n=4).

COVID-19 revisions

Recruitment

We will recruit participants from two communities where BADAS has worked previously that were not exposed to any community mobilisation interventions, and that are close to the district headquarters of Faridpur. One will be near a body of water. We will phone male and female community members (informants) who were members of research advisory groups, and request their help to locate respondents for formative research. These informants had consented to receiving phone calls from BADAS during the research and afterwards. They will be contacted by a BADAS staff member who is familiar to them and asked to locate potential respondents for small group discussions and semi-

structured interviews who have access to a phone, and are willing to give their phone number and speak to a researcher. We anticipate that potential respondents will be approached in person if they live nearby the informant, as lockdown has lifted. We will ask them to and maintain rules of social distance and wear a mask if they interact in-person. If the potential participant lives far from the informant we anticipate that they will be contacted over the phone. Once the researcher (AA) receives the phone number, he will call to fully explain the study and take consent to conduct an interview over the phone. If a participant wishes, we will send a shortened information sheet by text message.

COVID-19 revised sampling and data collection

In order to understand community norms and experience of childhood injury and community norms of childcare of children under five years old, in each community we will purposively sample three women and three men, who are mothers/fathers or grandmothers/grandfathers of children under five. Each participant will be asked to invite a friend or relative of the same gender who they normally socialize or live with to join her in a group discussion. They will be provided with a mobile phone, and asked to take photos of things they perceive as risks and injury preventative resources in advance of a group discussion. They will send these digital photos to AA in advance of the discussion. Discussions will be conducted over the phone.

We will also purposively sample two families with a child under five and ask them to nominate a family member to take a video diary of an average day caring for their child (this could be a sibling, mother, father, auntie etc). These recordings will be sent to AA in advance of an interview. AA will discuss the content of the diary through a phone interview in relation to home hazards, child care practices and preventative possibilities.

We will purposively sample 8 families who have experienced these injuries in children under 5 in the past five years (four in each community). We will then conduct semi-structured interviews with these caregivers. If none of these caregivers are male, we will conduct 4 semi-structured interviews (n=4) with fathers of these children. These SSIs will be conducted over the phone.

We will interview two health workers (n=2) in order to triangulate information from community members and explore barriers to care-seeking and care-seeking behaviours after child injury. In addition, in order to describe the context of some existing interventions/strategies, we will conduct two key informant interviews with implementers of childhood injury interventions (n=2), and one with a child protection agency such as the police or other relevant body (n=1). These interviews will be conducted over the phone in a COVID-19 restricted situation.

Face to face data collection will not commence until it is safe to do so based on the national guidelines. If appropriate, masks will be provided for interviewers and respondents and interviews will take place outdoors with social distancing.

We will also conduct an analysis of the national policies/programmes/strategies on childhood injuries to understand the policy and structural context within which community action on childhood injuries, is situated.

We will transcribe, translate, and analyse qualitative data using the framework approach. At the end of this step we will have following outputs:

- 1- We will draft a PLA facilitation manual and a number of picture cards to accompany the manual, using the information collected during formative research and comprehensive literature review in Step 1. The manual will include essential information of risk factors for common UCIs and prevention strategies.
- 2- Information collected from FGDs and interviews with the stakeholders, and literature review (step 1) will help us to identify the potential themes for messages for the mass media/mHealth/poster

campaign. The developed messages (or a sample of them) then will be checked with TAG members during Step 4 and during a workshop with a number of caregivers of under 5 children as explained in Step 5.

- 3- A home injury hazard assessment checklist will be developed based on the data collected during the formative research or will adapted from the existing checklists.
- 4- Using information from formative research and steps 1 and 2, we will identify the most promising modifiable causal factors to address, as well as potential appropriate pathways to impact. Using this, we will develop a first draft of theory of change (ToC) map, which will be refined after steps 4 (Design and ToC workshop) and after piloting the intervention in step 7 (Dissemination).

Step 4 – Co-produce

Using the findings from our literature review (step 1) and our formative research (step 3) we will design the intervention package. This package is likely to include PLA groups, mass media messages and promotion campaigns, as well as household visits. We will discuss the design of these components of the intervention with the TAG members and to explore the feasibility of these components in the context and ensure the intervention is aligned with the evidence-based practices and policies. We will also discuss the ways that the intervention may change behaviour and achieve the desired outcomes (i.e. Improve knowledge and injury prevention behaviours of caregivers, and reduce injury-related incidence and mortality of children under 5 years old) through a ToC workshop. During the workshop, the draft ToC map that was developed after formative research will be discussed with the TAG to achieve a consensus/ common understanding on the casual pathways presented in ToC map.

In this step we will also have TAG member advice on the plan for piloting different intervention components and also the potential framework used for evaluating pilot testing and key pilot outcome measures and indicators of success and progression to trial phase.

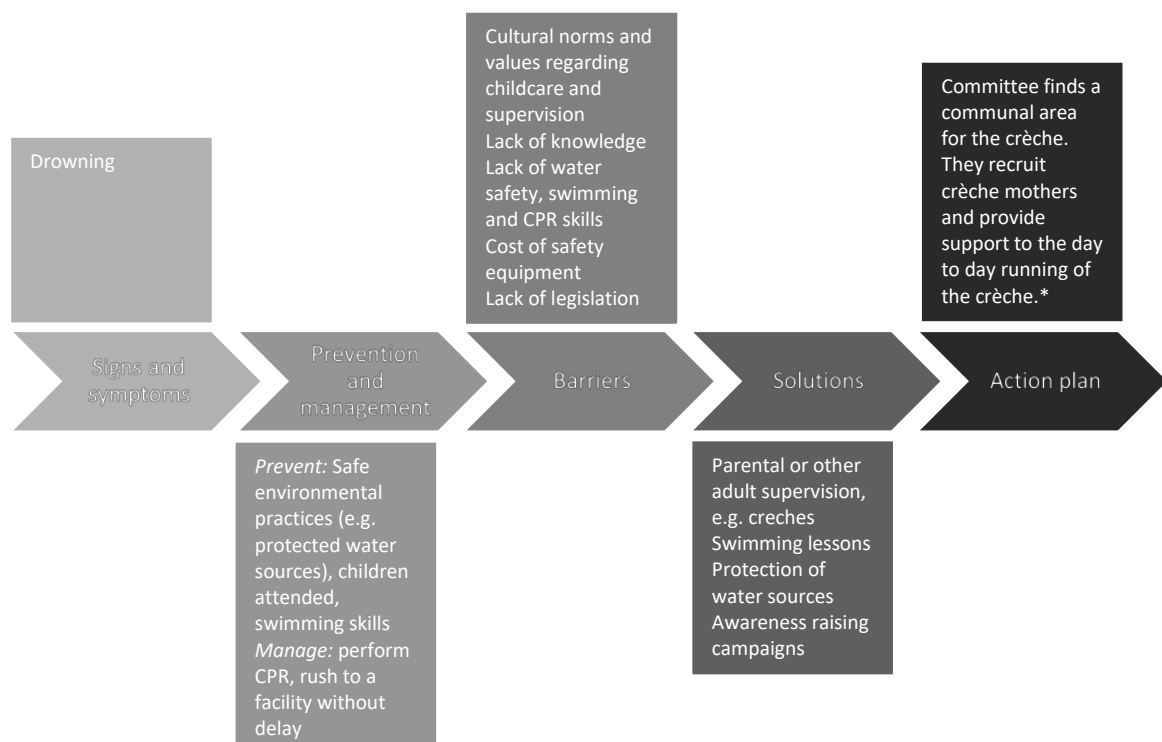
Step 5 – Implementation research/Pilot

The PLA approach will be adapted from previous studies^{48,58} to address childhood injuries and will be piloted in one village via one mixed male and female group or two separate PLA groups. We will seek advice on the most appropriate format from advisory groups and be informed by formative research. The groups will be open to all community members who are concerned about childhood injuries and will specifically target (or encourage to attend) caregivers with children under 5 (who are the main beneficiaries of this study).

The PLA group/s will be led by one/two incentivised group facilitators, who will be recruited from the pilot village. The facilitators will receive one week's training on group facilitation, PLA cycle and structure of each meeting, and basic health messages related to unintentional injuries causes and prevention strategies. They will also be provided with a community action manual (developed after formative research) with essential information on main under 5 unintentional injuries, their causes and prevention strategies. Moreover, the facilitator will be provided with (and received training on) a home injury hazard assessment checklist, which will be developed by the research team following the formative research.

In each 'injury' meeting, the group(s) will cover a different UCI. The injuries that will be included will be based on findings from the literature review and formative research to ensure the injuries included are the key injuries experienced within the communities. In each 'injury' meeting the groups will work through four questions: a) is this injury common?; b) what causes this injury and what practices can help to prevent the injury from happening or manage it if it has already happened?; c) what are the barriers to performing these practices?; and d) what locally feasible solutions can help to overcome these barriers? At the end of each 'injury' meeting the groups will be guided to develop an action plan to deliver their solutions and benefit the whole community.

Please see below, figure 5, an example of how the discussion are likely to proceed for drowning:



* We have only provided an action plan for one of the solutions, as illustration

Moreover, the group facilitators and/or group members will conduct a number of home visits using the home injury hazard assessment checklist.

As mentioned earlier, we will hold an interactive validation workshop with a number of caregivers (n=10/15), ideally those attended the PLA meetings, to have their opinion on the potential themes for messages and also sample messages for mass media/m-health/poster campaign. The objective for the workshop will be to prioritise the themes/topics to focus in the campaign based on the participants feedback and to elicit their opinion of the messages in terms of dimensions such as comprehension (or clarity), mode of delivery (e.g., SMS, voice message, poster, radio), preferred style formal/informal (e.g., health professional voice or drama). The messages will be revised based on the feedback received by the participants.

Covid-19 adaptations:

PLA group meetings will be run as described above with the following main modifications:

- Infection Prevention and Control practices at all time by facilitator and participants
- Limiting numbers attending PLA group meetings (12-16 participants)
- Including Infection Prevention and Control in the PLA manual
- The meeting will be held outside in a well-ventilated outdoor space with social distancing
- All participants will be screened with a short questionnaire and temperature check before joining the meeting
- We will ask those who are sick or a household member with symptoms of COVID-19 not to come to the meeting.

Similar to formative research, if we are not able to hold face to face validation workshop with infection control measures described earlier, we will conduct a number of telephone interview and group discussions with caregivers (n=10/15) to prioritise the themes/topics for the campaign and to have their opinion on the example voice/text messages.

Step 6 – Implementation research/pilot evaluation

Progression to Phase 2 (i.e., a large-scale evaluation or trial) will depend on the criteria used to assess the pilot testing of the intervention. These criteria will be assessed by employing a qualitative process evaluation, through observations and engagement with beneficiaries and other stakeholders during the piloting phase of our study, to assess reach/accessibility of the intervention, barriers to participation, participants willingness and ability to engage with the intervention, and to model its potential to catalyse behaviour change.

We will use MRC guide to process evaluation for complex intervention⁵⁹ as the main theoretical framework to evaluate pilot testing of intervention. Using the guide, which is structured around three components of context, implementation and mechanisms of impact, we will assess fidelity and quality of pilot implementation, give a better understanding of causal mechanisms and identify potential contextual factors affect the implementation, study outcomes or generalisability of the findings. We will also draw on implementation research outcomes variables⁶⁰ (i.e., acceptability, adoption, appropriateness, feasibility, fidelity, implementation cost, coverage and sustainability), in particular acceptability and feasibility indicators, as the potential intervention is novel and multi-component. These indicators can be seen as intermediate factors that contribute to the intervention final outcome (i.e., incidence of injuries). Table 4 provides details on different dimensions/indicators will be used in the evaluation and how they will be assessed.

Table 4: Draft process evaluation questions to assess pilot implementation of the intervention

Indicators/dimensions	Key Questions	Source of Information/data collection method
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Reach (accessibility/coverage)	Did the intervention reach the main beneficiaries of the intervention? Did the intervention access different socio-demographic groups (ethnicity, religion, gender, age, literacy/education level) equally? Or how different groups engage with the intervention process? What factors contribute to the participation/non-participation of the participants (Reasons for non-attendance)? What might have been done to get more of the main beneficiaries to participate?	Monitoring data SSIs and FGDs with participants and community members
Fidelity (or quality of intervention delivery)	Was the intervention implemented as intended? How was the intervention adapted to the setting of study? What were the alterations made to the intervention to better fit to the context (e.g., adjustment in recruitment of/reaching the main beneficiaries, adjustments in the content and delivery approach)?	SSIs with facilitators and staff Observations of PLA meetings
Dose	How much of the intervention was delivered? For example, how many PLA meetings were delivered? How regularly the meeting were held? How many community meeting was held?	Monitoring data SSIs with facilitators and staff Observations
Context	How does context shape the needs and experiences of participants and staff, and affect intervention implementation? What are the potential barriers and facilitators to implementation of intervention?	SSIs and FGDs with staff and participants and community members Observations of PLA meetings and home environment
Acceptability	How participants and the community engaged with the intervention? what is their overall experience of the intervention? Was the intervention acceptable by the participants? What factors affected acceptability of the intervention?	SSIs and FGDs with participants and community members Drop out number, % reduction in attendance
Feasibility (Practicality/suitability)	Is the intervention appropriate and can be successfully adopted or carried out in this particular setting (and also considering resource requirement)? Can the intervention generate impact? - Did intervention improve knowledge? - Barriers (and facilitators, at all levels) to implementing actions developed by groups?	SSIs and FGDs with staff and participants and community members

SSIs: Semi-structured interviews; FGDs: focus group discussions

Other essential information will be collected and recorded during the evaluation will be potential unexpected benefits and harms caused by the intervention implementation, and process data such as recruitment and attendance rates, participant characteristics and potential cost of designing and implementing the intervention. These information and other contextual data collected during this step will be useful for planning phase 2 (large scale evaluation/trial) of this study. For example, what evaluation design will be appropriate, potential clusters, sample size, and risk of contamination.

The data will be collected by an experienced qualitative researcher through observation of intervention delivery and processes, home and community environment observations, semi-structured interviews with participants (n= 5-10), community leaders (n=5), PLA facilitators (n=2-5) and study team. The data collected will be analysed using the framework approach.

At the end of this step, necessary changes will be made to the intervention components.

Step 7 – Dissemination

We will share the findings from the pilot evaluation with local stakeholders, including community members and leaders, community healthcare providers, local authorities, and injury experts, through a workshop or series of meetings to explore their views on the findings. In addition, the findings will

be share with the TAG members to have their recommendation on issues such as progression to phase 2, the contents of the intervention package, modified theory of change and pathway to impacts, and potential evaluation design for the next phase of study.

At the end of this step, the package of intervention and its contents, theory of change and evaluation design for phase 2 will be agreed on and a proposal for full impact testing at scale will be written.

TIME-LINE OF THE STUDY

Activities	Preparations			2020						2021												
	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Protocol development																						
Scoping reviews of risk factors																						
Realist review of intervenitons																						
Preparing interview and FGD guides																						
UCL Ethics application																						
BADAS Ethics application																						
Engagement with local Stakeholders																						
Frist Technical Advisory Group meeting																						
Formative Research: qualitative data collection and data analysis																						
First draft of Intervention package, theory of change (ToC) and evaluation framework for pilot will be developed																						
Design workshop and second Technical Advisory Group meeting																						
Piloting PLA and pre-testing other intervention components																						
(Process) evaluation of pilot impelmentation																						
Dissimination of findings of pilot evaluation to local stakeholders																						
Final TAG meeting																						
Agreed on Intervention components, ToC and Phase 2 evaluation design																						

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Annex 1: Scoping review protocol

Title: Epidemiology and risk factors for under 5 unintentional childhood injuries in Bangladesh: A scoping review

Aim

This study aims to review the literature on the epidemiology of unintentional childhood injuries among children under 5 and associated risk factors in rural Bangladesh to inform the formative research, theory of change, and intervention package design.

Review objectives

1. To map the existing evidences on epidemiology of under 5 unintentional childhood injuries in rural Bangladesh.
2. To identify the risk factors for unintentional childhood injuries among children under 5 in rural Bangladesh.
3. To identify potential modifiable causes/risk factors that can be addressed through interventions.

Study design

A scoping review of the literature, using Arskey and O'Malley six-stage framework approach (Arksey & O'Malley 2005) will be followed. The process will also be guided by the recommendations by Levac, Colquhoun and O'Brien, which is an extended version of the Arskey and O'Malley framework (Levac et al. 2010). The recommendations by Joanna Briggs Institute (JBI), which subsequently modified the scoping review methods will also be followed (Peters et al. 2015).

Stage 1: Identifying the research question

The research questions will guide the search strategy, mapping of the evidences, and reporting of the results: (1) what are the existing evidences on epidemiology and risk factors for under 5 unintentional childhood injuries in Bangladesh? (2) what type of injuries most commonly cause death and morbidity among under 5 children in Bangladesh? (3) what are the risk factors associated with different type of childhood injuries? (4) what are the potential modifiable risk factors that can be addressed through interventions? In addition to these questions, we will also explore what prevention strategies are proposed by the authors of the selected studies to mitigate the identified risk factors. These questions will iterative our thinking during the review.

Stage 2: Identifying relevant studies

A systematic search strategy will be carried out for the selection of the literature. The identification of relevant studies will be done following the three-step process recommended by the JBI. In the first step, the relevant literature will be identified through the use of electronic databases, followed by an analysis of text words contained in the title and abstract, and of the index terms used to describe the article. Search will be done in the MEDLINE/PubMed, Web of Science, Google scholar, and local databases for both published and grey literature. Secondly, a search using all identified keywords and index terms will then be undertaken across all included databases. The key search terms are epidemiology OR "risk factors" OR "risk factor" OR causes, childhood OR child, injuries OR injury OR trauma OR drowning OR "road traffic injuries" OR "road traffic injury" OR "road crash injuries" OR "road crash injury" OR "road accidents" OR "road accident" OR "road injuries" OR "road injury" OR falls OR fall OR burns OR burn OR electrocutions OR electrocution OR poisoning OR cuts OR cut OR "animal bites" OR "animal bite" OR bites OR bite, Bangladesh. Thirdly, reference list of all selected papers will be searched for additional studies. Search results will be imported using Mendeley, and duplicates will be deleted prior to screening according to the inclusion and exclusion criteria. Research team will meet after the first search to discuss any challenges or ambiguities related to search strategy and study selection, and go back and refine the process if required.

Stage 3: Study selection

This stage will involve setting of inclusion and exclusion criteria. Studies generated by the search will then be screened according to the inclusion and exclusion criteria in a three-step selection process. The first screen will be based on the relevance of the titles and abstracts, followed by a second screen after reading the remaining articles in full if the relevance of a study is not clear from the titles and abstracts. In the next step, reviewers will read the full articles to make the final decision about whether they should be selected for inclusion in the review.

Inclusion criteria

Both published and grey literature related solely or in part to childhood injuries among the age group 0-5 years will be included. The studies published on Bangladesh, either in rural or urban regardless of the year of publication, will be considered for reviewing. Literature published in English will be considered.

Exclusion criteria

The studies were conducted on childhood injuries but not included the age group 0-5 lack discussion on epidemiology and risk factors will be excluded.

Stage 4: Charting the data

A 'data charting form' will be developed reflecting the research questions and the objectives of the review. Data will be extracted and charted regarding the key characteristics of the studies, such as type of injury, author(s), year of publication, characteristics of the study population (age group recruited), methodology and study design, study location (rural/urban, geographical position), sample size, prevalence/incidence rate of injuries, major findings on epidemiology and risk factors. The whole data charting process will be done in an iterative manner in which the team continually will update the 'data charting form'. Using the 'data charting form' two reviewers independently will trial the extraction form on randomly selected studies from each injury type and meet to ensure whether the approach to data extraction is consistent with the research questions and all relevant results are extracted. Two data charting tables will be produced: a general table will cover all key characteristics of the studies, and a risk factors table will include all child, caregiver and environmental (physical and socio-cultural) related factors under every type of injury. The risk factors table will also include the modifiable risk factors.

Stage 5: Collating, summarising and reporting the results

The charted data will be collated, summarised and reported to effectively map the risk factors for childhood injuries. This stage will further be split into three steps and completed, suggested by Levac *et al*:

(a) **Collation and analysis:** Charted data will be collated and summarised. Focusing upon the objectives and research questions the extracted results will be classified under main conceptual categories, such as study population, methodology and study design, study location (geographical) prevalence/incidence rate, and major findings (epidemiology and risk factors). First, tables and charts mapping will be produced to provide an overview about findings. Second, papers will be organized thematically according to the type of injuries, such as drowning, falls, burns, road traffic injuries, poisoning, cuts and injuries due to blunt objects, and animal bites.

(b) **Reporting:** The results will be reported in such a way as to guide and inform the study objectives, and research questions.

(c) **Implication of the findings:** The study findings will be used to inform a formative data collection study, and to develop an intervention package for preventing under 5 childhood injuries.

Stage 6: Consultation

The consultation stage aims to involve two groups of stakeholders: injury experts from both national and international levels; and managers/practitioners from local and international organizations. We will orient stakeholders on the scoping review purpose, research questions and preliminary findings to receive their suggestions and to ensure that the data have been clearly and accurately presented.

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Annex 2: Draft protocol for realist scoping review

A realist scoping review of the interventions for childhood unintentional injuries in Bangladesh and similar settings to Bangladesh

Aim: This review aims to explore the interventions implemented to prevent childhood unintentional injuries and to identify causal mechanisms can best explain the observed outcomes of the interventions.

Objectives:

- 1) to identify interventions/programs implemented to address unintentional injuries in Bangladesh and similar settings to Bangladesh,
- 2) to describe the main characteristics of the interventions (such as evaluation design, underlying theory/hypothesis, implementation context)
- 3) to identify potential causal mechanisms that can explain the observed outcomes

Study design

Arskey and O'Malley six-stage framework approach for scoping review (Arksey & O'Malley 2005) will be followed. However, data extraction, synthesis and reporting (stage 5) will follow a realist approach suggested by Best et al (2012) and Haynes et al (2018).

Database

The relevant literature will be identified through the use of electronic databases, website of the relevant organisations, and consultation with injury experts. Search will be done in the MEDLINE/PubMed, Web of Science, Google scholar, and WHO, world Bank and other relevant organisations for both published and grey literature. Reference list of the selected paper will be searched. Moreover, injury experts in Bangladesh, WHO and neighbouring countries will be reached in order to identify the (successful or unsuccessful) interventions that their findings are not published.

Keywords

Intervention/Programme, unintentional childhood/child injuries, drowning, road traffic injuries/road crash injuries, falls, burns, animal bites, poisoning, Bangladesh, LMICs, South Asian Regional Cooperation/ SARC countries (Afghanistan, Bangladesh, Bhutan, India, the Maldives, Nepal, Pakistan and Sri Lanka)

Inclusion criteria

1. All interventions/programmes targeting unintentional childhood injuries
2. All interventions/programmes in LMICs (and SARC)
3. Published in English

Exclusion criteria

1. Interventions that target adults only

References:

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