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Context of water related disasters in Bangladesh: A mixed methods study

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Context of water related disasters in Bangladesh: A mixed methods study

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Keywords: Natural disaster, disaster preparedness, low and middle income countries, drowning, flooding.

ABSTRACT

Objectives:

To investigate the impact of natural disasters on communities in the Barisal division of Bangladesh, exploring community approaches to disaster preparedness and mitigation.

Setting:

Communities in all districts of the Barisal division of Bangladesh.

Participants:

Quantitative data was collected through a cross-sectional household survey (n=9263) with household heads, mothers and other adults aged 18 years and above. Qualitative data was collected through in-depth interviews (n=7) and focus group discussions (n=23) with key informants from the community residing in Barisal for at least six months prior to the study.

Outcome measures:

Quantitative research recorded features of natural disaster events from the previous five years, documenting risk factors that increase vulnerability to disaster, the use of disaster warning systems, and evacuation processes at the time of disaster. Qualitative research investigated disaster risk perceptions, experiences during and following disaster, and disaster preparedness practices.

Results:

The survey response rate was 94.7%. Exposure to disaster in the last five years was high (82%) with flooding followed by cyclones considered the greatest threats. Awareness of evacuation processes was low, and only 19% of respondents reported evacuating their homes at the time of disaster. Drowning during disaster was the primary concern (87%), followed by debt, livestock and crop loss (78%). The qualitative data amalgamated into four overarching themes: 1) Perceptions and consequences of disaster; 2) Insufficient support for the most vulnerable; 3) Community preparedness and practices; 4) Barriers to disaster response and improving resilience.

Conclusions:

Critical to achieving disaster resilience is increased government investment in infrastructure and systems level responses that empower communities. Further research can support this by addressing the community challenges to promoting disaster resilience, and investigating how existing community strengths can be leveraged to implement locally owned solutions.

Trial registration:

N/A

Strengths and Limitations

- To our knowledge, this is the first large scale study reporting on context of disasters, using mixed methods from a LMIC.
- This study was conducted in a LMIC prone to water-related disasters and the results may not be generalizable to other LMIC settings; however the qualitative focus group discussions and in-depth interviews spanned a diverse array of participants and yielded rich data that greatly contextualized the cross-sectional survey
- Consultations with government representatives are likely to have provided additional insight into existing government initiatives targeted at disaster preparedness and response

INTRODUCTION

Internationally, there is an increasing focus on strengthening disaster risk reduction through improved surveillance, information exchange, early warning systems and capacity building in disaster prone countries. Bangladesh is highly prone to natural disasters, in particular flooding due to the annual monsoon rainfalls and extensive low lying floodplains that cover an estimated 80% of the densely populated country¹. The consequences of flooding include the threat of diarrhoeal disease, lack of access to safe drinking water, loss of housing, livestock, crops, livelihood activities and drowning in floodwaters^{1,2}. Additionally, tropical cyclones are an annual occurrence, which directly contribute to flooding and in turn, drowning-related mortality and morbidity².

With a population of over 165 million, it is estimated that more than two thirds of people in Bangladesh live in regions at risk of floods and one quarter live in regions at risk of cyclone; this represents significant vulnerability to both fatal and non-fatal drowning². Drowning is among the world's leading causes of injury-related death, of which more than 90% of drowning fatalities occurring in low and middle income countries (LMICs)³. Data on morbidity resulting from non-fatal drowning is not routinely collected, due to poor operational definitions and under-resourced surveillance systems; thereby the burden of serious injury and lifelong disability is difficult to quantify^{2,4}. In Bangladesh, fatal and non-fatal drowning rates are considered higher than for other LMICs, indeed the fatal drowning rate is 15.8/100,000 per year, which is estimated to be 2-5 times higher than other LMICs^{3,4}. Within Bangladesh, both fatal and non-fatal drowning disproportionately impacts children and males and is most likely to occur in rural communities and in close proximity to households^{4,6}. Other risk factors for drowning include lower socio-economic status and lower educational attainment, with high rates of occupational drowning among workers in the fishing and water transport industries⁴.

From 2005 to 2015, governments around the world committed to implementing the Hyogo Framework for Action as a guideline for reducing disaster risk through resilience building at both the national and local levels⁷. In Bangladesh, since Cyclone Gorky in 1991, which claimed

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3 138,000 lives there has been improvements in warning systems and increased shelter uptake
4 over the last 20 years^{2 8}; however there remains considerable challenges in fostering disaster
5 resilience at all levels.
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10 More recently, the Sendai Framework for Disaster Risk Reduction 2015-2030 was adopted by
11 the United Nations member states in March 2015, and represents the next phase of targets and
12 priorities globally, recognising the threat that climate change and disaster risk pose to achieving
13 the Sustainable Development Goals (SDGs)⁹.
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19 The threat of natural disasters in Bangladesh is anticipated to increase with changing weather
20 patterns due to extreme vulnerability to climate change^{1 2 10 11}. In the face of growing climate
21 uncertainty, there is an urgent need to understand disaster practices and promote community
22 disaster resilience. Therefore, this study aims to investigate the impact of natural disasters on
23 communities in the Barisal division of Bangladesh, exploring community disaster preparedness,
24 responses to disaster at time of onset, and health seeking behaviours following disaster events.
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32 **METHODS**

33 **Study setting**

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35 The Barisal division is located in south central Bangladesh and is comprised of six districts and
36 39 sub-districts. Crossed by numerous rivers, it is highly exposed to flooding due to annual
37 monsoon rains and low lying flood plains.
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41 **Study design**

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43 The study used a concurrent mixed methods approach triangulating cross-sectional household
44 survey data with qualitative in-depth interviews and focus group discussions.
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47 **Patient and Public Involvement**

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49 Drowning was identified as a priority health issue through the 2014 Bangladesh Demographic
50 and Health Survey, which collected data from 18,000 residential households nation-wide.¹²
51 Data collection instruments for this study were developed in alignment with Bangladesh Health
52 and Injury Survey (BHIS) findings, designed to investigate notable drowning-related outcomes in
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3 greater depth. All data collection tools were trialled with end users prior to their use in this
4 study. Study results will be triangulated among key informants and consultations will be used to
5 inform the development of pilot interventions for improving water safety and reducing
6 drowning in community settings in Bangladesh.
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10 11 12 **MATERIALS AND DATA COLLECTION**

13 14 **Quantitative**

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16 The survey was conducted September 2016 – February 2017, using a multi-stage stratified
17 sample. A subsample of households (n=9263) was randomly selected (every tenth household)
18 from a larger cross-sectional household survey (n=92,616) that was conducted in all districts of
19 the Barisal division of Bangladesh.
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25 Trained data collectors used pre-tested structured questionnaires to collect information from
26 household heads, mothers or any adult above 18 years through face-to-face interviews. An
27 electronic data capture system (REDCap) was used on tablets for data collection¹³. To ensure
28 data quality and accuracy trained supervisors observed and checked 10% of interviews and
29 collected data, and re-interviewed 2% of households.
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36 The survey consisted of questions on knowledge, attitudes and perceptions/practices for
37 community drowning and disaster risk, and about experiences of natural disaster in the
38 previous five years. Data were collected on demographic characteristics, and on socio-economic
39 status using an index developed for the 2014 Bangladesh Demographic and Health Survey.¹²
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44 45 **Qualitative**

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47 Purposive sampling was used to identify key informants from the community for in-depth
48 interviews and focus group discussions. Inclusion criteria was that participants has been a
49 resident of Barisal for at least six months prior to the study. Separate male and female
50 discussion groups were arranged to align with cultural practices. The interviews and focus
51 group discussions were semi-structured and conducted by trained research assistants in
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3 community locations that were acceptable and accessible to participants. Consent was
4 obtained prior to commencing data collection; interviews lasted between 40-60 minutes, whilst
5 focus group discussions lasted between 1-1.5 hours. The interview and focus group discussion
6 guides included questions related to: 1) disaster risk perceptions; 2) experiences of natural
7 disaster; 3) disaster preparedness practices.

8
9 Interviews and focus group discussions were conducted in Bengali, audio-recorded, translated
10 and transcribed in English. To minimise data loss, interviews were jointly translated and
11 transcribed by the interviewing researcher and the translator, and a member of the research
12 team checked the translated transcripts. Interviews ceased when saturation of meaning was
13 considered to have occurred.

24 ANALYSIS

25 Quantitative

26 Descriptive analysis (counts and percentages) of variables relating to disaster knowledge,
27 attitudes and behaviour variables. All data were analysed using SAS 9.4 with SAS/STAT 14.2
28 (SAS Institute, Cary, NC, USA).

34 Qualitative

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36 Transcripts were imported into NVivo qualitative data analysis software (QSR International Pty
37 Ltd. V.11, 2015). Content analysis was applied to the transcripts whereby overarching themes
38 were initially developed. Thereafter, deductive thematic coding of the data was undertaken.
39 NVivo was used to arrange the text according to codes and manage the codes in the
40 interpretive phase. Two researchers independently conducted the coding and arrived at
41 consensus on the analyses.

49 RESULTS

51 Quantitative results

52 A total of 95,124 households were visited of which 92,616 household representatives were
53 available for completing the survey (n= 92616; response rate 94.7%), with an average
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household size of 4.2 members. The socio-demographic characteristics of the disaster subsample were comparable to the full household survey sample and there were no meaningful differences between the samples (Table 1).

Table 1 Socio-demographics of the full household survey and disaster survey subsample

		Disaster subsample (n=38981)	Full household sample (n=385127)
Age (years)	Infant	2.0% (1.8 - 2.2)	2.0% (1.9 - 2.0)
	1-4	8.1% (7.8 - 8.5)	8.2% (8.0 - 8.3)
	5-9	11.0% (10.7 - 11.4)	10.7% (10.5 - 10.8)
	10-14	10.8% (10.5 - 11.1)	10.7% (10.6 - 10.9)
	15-17	5.9% (5.6 - 6.2)	6.0% (5.9 - 6.1)
	18-24	13.6% (13.1 - 14.1)	14.0% (13.8 - 14.2)
	25-39	24.6% (24.0 - 25.2)	24.1% (23.7 - 24.4)
	40-59	17.1% (16.6 - 17.5)	17.5% (17.3 - 17.7)
	60 +	6.8% (6.4 - 7.1)	6.9% (6.7 - 7.1)
Sex	Male	49.1% (48.5 - 49.8)	49.2% (48.8 - 49.5)
	Female	50.9% (50.2 - 51.5)	50.8% (50.5 - 51.2)
Marital status	Married	50.4% (49.9 - 50.9)	50.6% (50.3 - 51.0)
	Never Married	45.7% (45.2 - 46.2)	45.3% (45.1 - 45.6)
	Divorced	0.3% (0.2 - 0.4)	0.3% (0.3 - 0.4)
	Widow/Widower	3.4% (3.2 - 3.7)	3.5% (3.4 - 3.7)
	Separated	0.2% (0.1 - 0.2)	0.2% (0.2 - 0.2)
Type of family	Nuclear Family	67.5% (65.4 - 69.7)	66.6% (64.8 - 68.3)
	Extended Family	32.5% (30.3 - 34.6)	33.4% (31.7 - 35.2)
Family size	5 or less persons	78.6% (77.0 - 80.3)	78.6% (77.4 - 79.8)
	More than 5 persons	21.4% (19.7 - 23.0)	21.4% (20.2 - 22.6)
Education completed	Not applicable	16.3% (15.4 - 17.3)	16.2% (15.2 - 17.1)
	1 to 5 years	39.9% (38.9 - 40.9)	39.8% (39.0 - 40.7)
	6 to 8 years	17.9% (17.3 - 18.5)	17.6% (17.2 - 18.1)
	9 to 12 years	16.4% (15.6 - 17.3)	16.6% (16.0 - 17.2)
	13 to 17 years	3.7% (3.3 - 4.0)	3.7% (3.4 - 3.9)
	None	5.7% (4.8 - 6.7)	6.1% (5.2 - 7.0)
Maternal education	1 to 5 years	47.9% (46.4 - 49.5)	46.3% (45.1 - 47.5)
	6 to 8 years	20.6% (19.3 - 21.8)	20.5% (19.5 - 21.4)
	9 to 12 years	13.2% (12.1 - 14.4)	14.2% (13.5 - 15.0)
	13 to 17 years	1.5% (1.2 - 1.8)	1.4% (1.3 - 1.6)
	None	16.7% (15.3 - 18.2)	17.6% (16.4 - 18.8)
Monthly income (Taka/month)	<7000	9.0% (7.9 - 10.2)	9.2% (8.2 - 10.2)
	7000-8999	16.2% (14.8 - 17.6)	16.8% (15.8 - 17.7)
	9000-11999	25.8% (24.0 - 27.6)	25.9% (24.5 - 27.2)
	12000-14999	17.8% (16.4 - 19.2)	17.5% (16.6 - 18.4)

	15000	31.2% (28.6 - 33.7)	30.7% (28.6 - 32.7)
Primary occupation	Agriculture	6.4% (5.8 - 6.9)	6.3% (5.8 - 6.8)
	Business	5.9% (5.5 - 6.2)	5.8% (5.6 - 6.0)
	Student	27.9% (27.4 - 28.5)	27.5% (27.2 - 27.9)
	Domestic work	28.5% (28.1 - 28.8)	28.6% (28.4 - 28.9)
	Service	3.7% (3.4 - 4.1)	3.9% (3.7 - 4.2)
	Not working	3.2% (2.9 - 3.5)	3.3% (3.1 - 3.5)
	Skilled	3.8% (3.5 - 4.0)	3.7% (3.5 - 3.9)
	Unskilled	6.8% (6.3 - 7.3)	7.0% (6.5 - 7.4)
	Other	13.8% (13.4 - 14.3)	13.8% (13.6 - 14.1)

Types of disaster

The most common natural disaster events experienced by respondents were flooding/flash flooding (43%) and cyclone (35%). The majority of respondents (82%) reported experiencing one or more natural disasters in the previous five years and of these, two thirds believed flooding/flash flooding to be the greatest threat followed by cyclones/big storms.

Vulnerability and impact

Respondents were asked which members of the population were most likely to be impacted by natural disasters. Age was considered to be an important factor with older people (23%) and children (19%) considered to be most susceptible. Poor socioeconomic status (21%) was perceived to increase vulnerability to natural disasters. The types of work that was perceived to be most affected by the natural disaster were farming (32%), labourer jobs (31%) and fishing (20%).

Drowning during disaster was the primary concern for 87% of the respondents. A small proportion (10%), of respondents considered health to be a priority during disaster, while debt, livestock and crop loss were prevailing concerns among the majority of respondents (78%).

Risk and protective factors

The survey asked two separate questions with respect to weather forecast and warning signals. Only 18% of the respondents reported having received any type of weather forecast information prior to the most recent natural disaster that they had experienced (Figure 1). The

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3 most frequent sources of weather forecast information mentioned were from television, alarm
4 or loud speakers, and through friends, families or neighbours.
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8 **Figure 1: Sources of weather forecast information (%)**

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12 A high proportion of respondents (70%) reported having received warning signals prior to the
13 onset of natural disaster. Although almost all households (94.8%) had at least one member who
14 owned a mobile phone, the most common source of warning signal was television followed by
15 warnings from local authorities and volunteers (Figure 2).
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21 **Figure 2: Sources of warning signal information (%)**

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25 The majority of respondents (94.8%) reported their household roof to be made of tin and only
26 3.9% reported to have a concrete roof. Walls were made of tin for 85.2% of households and
27 brick and plaster for 11% of the households.
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32 **Disaster preparedness practices**

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34 Among respondents who reported to have experienced a natural disaster, only 19% evacuated
35 at the time of the disaster. Limited money followed by limited time were identified as the two
36 most common barriers to disaster preparedness (data not shown). Of the 81% of respondents
37 who reported not evacuating, 44% believed that it was not required and that an alternative
38 shelter was not easily accessible, while 38% did not evacuate because of concerns about the
39 security of their property (25%) and protection of livestock (13%). Less than 5% of community
40 members were aware of evacuation processes or safe evacuation points/places.
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49 Among respondents who had experienced disaster, only 22% reported moving to an alternate
50 shelter during the most recent disaster. Of these, all were self-initiated with no rescues
51 required from residences. Cyclone shelters (54%) were used most often followed by
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educational institutions (23%), flood shelter (13%), relative's home (9%) and community centre (1%).

Qualitative results

The interviewee characteristics are presented in Table 2. The four focus groups consisted of two male groups and two female groups, with characteristics presented in Table 3.

Table 2 Characteristics of in-depth interview participants

Table 3 Characteristics of focus group discussion participants

	Gender	Age range (years)	N in each group	Occupation
FGD1	M	30-60	6	Small business owners, fishermen, shop keepers
FGD2	M	Unknown	6	Business men and fishermen
FGD3	F	25-50	6	Housewives
FGD4	F	25-50	5	Housewives

Four overarching themes emerged from the qualitative data: 1) Perceptions and consequences of disaster; 2) Insufficient support for the most vulnerable (economically, geographically and personal physical attributes); 3) Community preparedness and practices; 4) Barriers to disaster response and improving resilience. The four overarching themes were drawn together from key sub themes, which are presented in Table 4 with illustrative quotes.

Perceptions of risk and consequences of disaster

Experiences of water-related disaster were common while community perceptions about the cause of such disasters were entrenched in beliefs that disasters were not preventable. This caused disaster-related death to be considered unavoidable, or to occur as a result of "Allah's will". However, there was also acknowledgment of the relationship between water-related disasters and climate uncertainty, which was attributed to the impacts of pollution.

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5 A major concern for community members was the consequences of disaster on agriculture,
6 with erosion and loss of crops and livestock having a devastating impact on communities. In
7 particular, loss of livestock was a significant concern for farmers, and the need to protect
8 livestock presented a major impediment to evacuation. Similarly, theft and looting were cited
9 as both a consequence of disaster and an impediment to evacuation. In terms of health
10 consequences, drowning and illness due to poor sanitation post-disaster were considered to be
11 major contributors to disaster-related morbidity and mortality.
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20 **Insufficient support for the most vulnerable**

21 Respondents frequently reported on the structural weakness of existing dwellings and their
22 inability to remain structurally sound during a disaster event. A number of personal
23 characteristics were repeatedly associated with increased vulnerability to drowning. Many of
24 these surrounded the notion of 'weakness' – an inability to move quickly, hold onto stationary
25 objects when caught in flood waters, swim against currents, climb to safe areas above flood
26 waters, or carry belongings overhead when crossing flood waters.
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34 A number of characteristics were specific to women, such as the traditional clothing worn
35 becoming heavy when wet, or long hair becoming caught on objects preventing escape from
36 flood waters. Statements were made about the care a woman feels for her children, which
37 made her a liability to the broader family and there were suggestions that women were less
38 able than men to maintain calm or plan rationally in high pressure situations.
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45 **Community preparedness and practices**

46 Community members interpreted warning signals in different ways, each having their own
47 thresholds for deciding when evacuation is necessary. Previous warning signals given for
48 seemingly minor events caused many participants to be skeptical about the urgency of signals.
49 Not all community members owned a TV or radio and as power is often lost during weather
50 events, so loudspeaker announcements in village settings were considered to be most the
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3 effective warning signal, which appear to be predominantly coordinated by NGOs. Warning
4 signals were either based on a 10-point scale which indicates event severity, or are a simple call
5 for evacuation, directing community members towards cyclone shelters and other protected
6 areas of the community.
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12 Many drowning deaths were reported to be caused by people evacuating their households
13 after not responding to early warnings. Despite this, evacuation is considered an inconvenience
14 to community members due to difficulties with transporting less-mobile people and the looting
15 that frequently occurs when households are left unattended. One participant reported thieves
16 staging false disaster warning signals for an opportunity to rob empty households.
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23 **Barriers to disaster response and improving resilience**

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25 Although there were a number of approaches documented towards disaster preparedness,
26 management and relief, many of these were considered to be unreliable or unsustainable.
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28 Many participants discussed disaster management education provided by NGOs in community
29 settings. Although useful, these education programs were reported to be sporadic and with
30 varied content. A lack of resources limited the extent individuals were able implement the
31 practices taught. Consequently, disaster preparedness was predominately managed by
32 individual community members.
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40 Government initiatives primarily focused on protection at time of disaster and relief post-
41 disaster. A number of cyclone shelters had been built by government in community settings and
42 were frequently used by the most vulnerable members of the community at the time of
43 disaster. Despite this, cyclone shelters were reported to be difficult to access due to unsafe
44 roads and long distances between shelters. Furthermore, shelters were reportedly often over-
45 crowded, had poor structural quality, and potentially unsafe places for women. There was
46 clearly lack of faith in governance and systems, with many comments concerning unequal
47 distribution of government relief post-disaster, and examples of bribery and nepotism.
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Government post-disaster relief was only available over short periods of time post-event and in some cases, was also provided sporadically by NGOs.

Table 4: Key subthemes from qualitative analysis with illustrative quotes

Theme	Key sub-themes		Illustrative quotes
Perceptions of risk and consequences of disaster	1. Perceived causes of disaster	1a. Beliefs	<i>"And why these happen, I cannot say. Allah wishes - that's why it happens brother. Everything happens when Allah wishes." (P2, M, fisherman and shop owner)</i>
		1b. Climate change	<i>"Car, launch, steamer; all these release smoke which is harmful for nature and for that reason disaster takes place."(FGD2, M, small business owners))</i>
	2. Outcomes of disaster	2a. Loss of human life	<i>"We saw many dead bodies of people beside the road." (FGD1, M, business men and fishermen)</i>
		2b. Loss of livestock, agricultural land and produce	<i>"What is more problem is, the fishes of the pond go away. Because of this, the people suffer from financial problems. They lose everything." (P6, F, social worker)</i> <i>"The storm destroyed all the crops. I don't know whether we will get any rice or not from the grain." (FGD3, F, housewives)</i>
		2c. Damaged households	<i>"Now look at that broken house which is left there. That house was made newly, it was built only two to three months ago. Suddenly it was hit by the storm." (P7, F, housewife and NGO employee)</i>
		2d. Theft	<i>"We stay at home because if we leave the house the things will be stolen. We have nothing else than these things of the house. That's why we try to stay at the houses long as we can." (P3, M, agricultural worker)</i>
		2e. Damaged public infrastructure	<i>"Children cannot go to school and people have to swim to cross the roads. [The market] and cooking became a great problem." (FGD4, F, housewives)</i>
		2f. Illness	<i>"When water comes during calamity, if people drink that water, people suffer from many diseases." (P6, F, social worker)</i>
Insufficient support for	3. Increased vulnerability	3a. Gender issues	<i>"During this time [women] are considered as a burden by other members of the family. They cannot</i>

vulnerable			<p><i>move quickly, cannot come quickly.” (P6, F, social worker)</i></p> <p><i>“Women are in risk because they wear many clothes and they have long hair. That hair might be untied and get stuck or twisted with anything else. They don’t have that much strength. So they cannot free themselves.” (FGD2, M, businessmen and fishermen)</i></p>
		3b. Dependence on others	<p><i>“Children can't move alone and don't know how to swim. Someone is needed to guard them. Sometimes kids get lost when they are moving with their parents as we can hold something to stay safe, but the kids can't.” (P3, M, agricultural worker)</i></p>
		3c. Close proximity to water	<p><i>“All of us who were staying near the river bank, lost everything. Everything was broken down.” (P4, M, fisherman and labourer)</i></p>
Community preparedness and practices	4. Preparing for disaster	4a. Preparation of food and resources	<p><i>“And we arrange everything properly and tie up with the beam, so that later on we can get everything in proper order.” (FGD2, M, businessmen and fishermen)</i></p>
		4b. Modifications made to households	<p><i>“We put poles to support the house so that it doesn’t fall. We take a thick rope and tie up one end of that rope with the house and tie up the other end of rope with a big tree tightly, so that the house doesn’t fall during cyclone.” (FGD3, F, housewives)</i></p>
		4c. Self-made safety equipment	<p><i>“We make some floating materials with plastic bottle of soft drink, or plastic water bottle etc. I made those floating materials for all the members of my family.” (P6, F, social worker)</i></p>
		4d. Education provided by government and NGOs	<p><i>“Now everyone has got training. Everyone knows what is to be done, if there is cyclone. The people of coastal area have now become more conscious.” (P6, F, social worker)</i></p>
	5. Protection at time of disaster	5a. Heterogeneity in mode of communication	<p><i>“We receive information through radio and television. We even get to know what type of disaster is coming. We received signals during Aila. Mic was used in our area to aware people.” (P1, M, assistant teachers)</i></p>
		5b. Lack of compliance to warning systems	<p><i>“And another thing is people don’t want to go. As long as possible they try to stay in their own place. If they have left their things in that place then they might have lost their things. People don’t want to leave their resort in their entire life. That’s why</i></p>

			<i>problem increases more and people get hurt more by drowning in water.” (FGD1, M, small business owners)</i>
		5c. Reliance on cyclone shelters for protection	<i>“If we get information about flood, then we will have to move to [the cyclone shelter]. Apart from this we don’t have any alternative.” (FGD3, F, housewives)</i>
		5d. Cyclone shelters not meeting community needs	<i>“Cyclone centres are located far from this place. If these are located near to us then it would be possible to go to cyclone centre.” (FGD2, M, business men and fishermen)</i> <i>“Suppose there are two cyclone centres in our area. Already cracks have been developed in one building. Moreover they become filled up with people at the time when signal is shown.” (FGD2, M, business men and fishermen)</i>
		5e. Use of other resilient infrastructure for shelter	<i>“We took shelter in those people’s houses which were better means [than our house]. We took shelter in those houses which had strong foundation.” (FGD1, M, small business owners)</i>
		5f. Use of Indigenous floatation methods	<i>“We use banana tree to keep ourselves floating. When there is a flood, we cut down banana trees. This is the local method. By using these accessories, we can reduce drowning.” (P1, M, assistant teacher)</i>
Barriers to disaster response and improving resilience	6. Survival skills, rescue and resuscitation	6a. Lack of survival skills	<i>“A man in the north was totally puzzled and could decide which way to go with his old father. Then he was thinking whether he will save himself or will take his father. Then he tied up his father with a tree so that even if he dies at least his dead body will be found. Later on his father died tied up with that tree. Later, he was buried in the morning.” (FGD1, M, small business owners)</i> <i>“My grandson was seven months old. We put quilt, pillow in a big metallic utensil and then put him there and then said, ‘We are old. We cannot go to the marshy land, we cannot take him. Let him float on water. If Allah grants him life line then somehow he will survive and if he has no life line, then he will not be in this world anymore.” (FGD3, F, housewives)</i>

		6b. Rescue is a high-risk practice	<i>"While saving anyone from drowning he may also die. They have also several risks, like trees or boughs may break and fall on them." (FGD4, F, housewives)</i>
		6c. Resuscitation using traditional methods	<i>"[A] clay pot is grinded like powder and that powder is rubbed on the body. Then body has to cover with cotton so that water can release from his body. And if his body is moved taking his body on head, then he will remain alive." (FGD3, F, housewives)</i>
		6d. Minimal access to health facilities post-event	<i>"If someone gets injured by accident then we have hospital here but don't have doctor. If someone gets seriously injured by accident in that case we have nothing to do." (FGD2, M, business men and fishermen)</i>
	7. Disaster relief	7a. Multiple parties are involved in relief	<i>"Then there were help from many places. Not only the government, but also many states of the world helped then. We helped people [too]; providing various relief: medicines, foods. We volunteered in these tasks." (P2, M, fisherman and shop owner)</i>
		7b. Bribery and nepotism control relief distribution	<i>"At that time [those] who could give money as bribe he got that house and money. But [those] who actually needed he did not get the house and money." (FGD1, M, small business owners)</i>
	8. Improving disaster resilience	8a. Improve community awareness	<i>"Here I would like to emphasize that if the people are given more training on calamity, then I think the risk might be reduced to some extent. Training has to be imparted to all." (P6, F, social worker)</i>
		8b. Provision of floatation devices and signals	<i>"People like us can try to survive if given a ring buoy or life jacket. By the grace of Allah we might be able to live." (FGD2, M, business men and fishermen)</i>
		8c. Generate political will	<i>"We don't have any idea who will do it for us. There is no benefit in asking to the members or the chairman. During the election they promise us a lot of things which ultimately they don't fulfil." (FGD4, F, housewives)</i>
		8d. Construct more cyclone centres	<i>"Cyclone centre are not constructed where they are supposed to be constructed. These are constructed in the area where people have power and influence. It would have been very helpful to the people if these centres could be built after every one and one and half kilometres." (FGD1, M, small business owners)</i>

		8e. Improve housing standards	<i>"If good strong houses can be made, then they can stay much safer. See everyone don't have the ability to build strong a house. For them, suppose, if a strong firm house can be made after every 4th or 5th house, then they can take shelter there. Storm will not bother much then." (P2, M, fisherman and shop owner)</i>
		8f. Construct more embankments, barriers and dams	<i>"If block made of cement or concrete can be thrown beside the river bank then the people who live beside the river will remain well. And flood water will not be able to come easily. The river is breaking down in such a way this place will not last long." (FGD1, M, small business owners)</i>
		8g. Provide post-disaster medical service in community	<i>"When there is a disaster or flood, then if a service centre is established, it will be very good for us. The sick need not to be taken to remote areas. Their treatment can be managed from here." (P2, M, fisherman and shop owner)</i>
		8h. Use mosques for warning signals and shelter	<i>"If anything is announced from mosque, people give more importance to it and obey it. Again if Imam discusses these things, then people will be able to know more." (FGD1, M, small business owners)</i>
		8i. Increase tree plantations	<i>"You can plant many trees on the coastal area. That will save us from the stormy wind. But people don't plant trees because many of them have no place, no land or no money." (FGD2, M, business men and fishermen)</i>

DISCUSSION

This study has highlighted the considerable challenges confronting communities in disaster prone regions of Bangladesh in the face of inadequate warning systems, poor understanding and uptake of evacuation measures, and insufficient relief responses all of which are heightened for vulnerable sectors, populations in remote geographical areas and those who are economically deprived. Vulnerabilities to disaster emerged as a confluence of personal and household factors, and the impacts of disaster presented a heavy burden to communities in terms of housing, economic losses and the threat of drowning. Despite this, it was evident that disaster preparedness was not seen as a priority in the community, with a lack of preparedness

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3 and ineffective disaster response. Conversely, this study has also identified community
4 strengths that can be built upon as part of a comprehensive disaster resilience approach that
5 fosters community self-management of risk.
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10 A major impediment to effective disaster preparedness was the efficacy of warning systems.
11 Despite high levels of mobile phone penetration in Bangladesh, the majority of participants did
12 not receive warnings through this avenue. Furthermore, there was great heterogeneity in the
13 understanding and heeding of warning signals, which partially related to reluctance to evacuate
14 due to the threat of looting and thieves. Warning signal efficacy was also impacted by loss of
15 electricity during flooding and poor community confidence in warning systems. This is
16 consistent with Osti and Nakasu ¹ review of inadequate warning systems as part of overall
17 structural and non-structural interventions across 10 different southern and eastern Asian
18 countries during 21 fatal flood events. The authors reported that flood warning systems were
19 unreliable and that the content of the warnings was too technical for community members.
20 Taken together, these findings have critical implications for future research relating to
21 appropriate messaging and use of mobile technology in early warning systems.
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34 There is significant unmet community need for effective disaster response, which must be
35 addressed to move towards ensuring disaster resilience rather than recovery. While
36 communities demonstrated strength with self-reliance, it emerged that communities require a
37 systems level approach to be supported to develop disaster resilience. There is limited insight
38 into the ongoing mental health effects of disaster and how this impacts community resilience in
39 disaster prone regions ¹⁴. However, the present findings confirm previous research that
40 indicates disaster has a traumatic impact on families and communities. This signifies the need
41 for a mental health workforce that are competent in disaster-related trauma and are
42 responsive to the community in terms of culture, traditions, language and local practices ¹⁵.
43 Further research is critical to understanding the impact of psychological trauma, which women
44 may be more affected by than men, on community disaster resilience
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3 At the community level, there was considerable concern for preserving agriculture and
4 ultimately livelihoods. Protecting livestock was cited as a major impediment to evacuation and
5 contributed to disaster vulnerability. Individual and community level factors were key
6 contributors to vulnerability, in particular house construction, age and gender.
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12 Women were perceived to be more vulnerable than men, which was consistent with previous
13 research^{8 16}; however in high income settings, men have a higher mortality attributed to flood
14 related-drowning⁶. This is indicative of the “socially determined” role of women in many LMICs
15 and is aligned with an emerging focus in disaster literature on the role of women and how this
16 contributes to vulnerability^{8 14 16}. In Bangladesh, this is related to the socioeconomic status of
17 women, health status and perpetration of violence against women¹⁶. A cross-sectional survey
18 with mothers spanning two floods in Bangladesh in 2007, reported 86% of women experienced
19 intimate partner violence (physical, emotional, sexual and sustenance abuse) during a flood¹⁷.
20 This study also reported that both unintentional injury (cuts, falls, drowning etc.) and parental
21 violence against children is increased during flooding disaster¹⁷. Perpetration of parental
22 violence (physical, emotional and sustenance abuse) against children was highest in low
23 socioeconomic families, in families with household unemployment and among mothers;
24 particularly mothers engaged in domestic work (not employed) and those experiencing
25 intimate-partner violence, all of which related to the extreme survival pressure. While women
26 are seen as vulnerable to disaster and disaster-related trauma, there is great opportunity to
27 empower and educate women in disaster preparedness and management practices to promote
28 community resilience.¹⁴
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45 Natural disasters have a number of long-term indirect impacts on vulnerable populations.
46 Communities repeatedly exposed to disasters may experience forced migration, either to urban
47 centres or onto other hazard prone land.¹⁸ This contributes to rising land pressure, rapid
48 urbanisation and a breakdown of community and social structures which disproportionately
49 affects the poorest members of the population, increasing marginalisation.¹⁹ A lack of stability
50 and security establishes a poverty cycle²⁰ and enhances existing issues surrounding gender and
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3 social inequality.²¹ The under- age marriage and trafficking of young girls has been reported to
4 increase following disaster as children lose their parents, parents are unable to afford
5 education due to disaster repair costs, or as schools are destroyed during disaster, impacting
6 social-determinants of health adversely.²²
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10 11 12 **Implication for practice**

13 14 **Improve commitment from government**

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16 The Sendai Framework has one global target specific to LMICs which calls for adequate and
17 sustainable support for disaster preparedness and management which complements existing
18 national actions.
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23 Given the population density and scarce resources in the context, greater investment in
24 preparedness and education rather than management and recovery is needed in Bangladesh.
25 Disaster management was primarily undertaken by the NGOs/ multi- laterals, which was
26 reported to be inconsistent. There is a need for improved coordination between relevant
27 government agencies and NGOs to: 1) prevent overlap of interventions in certain areas and
28 support areas/communities currently without any interventions; 2) ensure the interventions
29 available are consistent and offered to a high standard; 3) ensure post-disaster aid is distributed
30 using regulated processes to areas of most need; and 4) ensure allocation of funding is fair and
31 appropriate governance mechanisms in place for distribution of support. Indeed Government
32 investment is essential to obtaining resources to improve basic public infrastructure (roads,
33 dams and river embankments), constructing protective infrastructure, such as cyclone shelters
34 and for improving the availability of emergency medical care post-disaster. In Bangladesh,
35 increased Government ownership and coordination could see considerable gains, however
36 better engagement with stakeholders at the community and policy level is needed to ensure a
37 community owned approach to promoting disaster resilience.
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51 52 **Build resilient communities by enabling self-management of disaster risk**

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3 All initiatives implemented should focus on empowering communities to mitigate disaster risk
4 locally. This will assist in the promotion of cost-effective, local approaches to disaster
5 preparedness, such as homemade personal floatation devices made from community sourced
6 and readily available materials. The findings report on how communities/society in rural
7 Bangladesh have organized themselves to increase resilience and manage disasters more
8 effectively.
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16 Participants reported not using cyclone shelters, however over-crowding of shelters was also
17 reported as a deterrent. Community ownership with respect to consultation on shelter location,
18 feasibility and usability of infrastructure to access shelters might address some of the mistrust
19 in governance/disaster management. This may be aided by building and using community
20 infrastructures such as schools or mosques as disaster shelters, which would be an efficient and
21 acceptable use of resources. Finally, whilst the community reported poor access to health
22 services generally, this was compounded during disasters when it was clear that the health
23 systems were non-existent; the need for resilient health systems cannot be over-stated.
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32 Resilience will also depend upon the capacity of disaster management practices to be adjusted
33 in a timely manner, in response to changing community priorities and the changing local
34 environment. There should be a focus on reducing internal community conflicts caused by the
35 provision of external resources to promote cohesive, united, community-based response to
36 disaster. This would be aided by formal disaster committees, which would be helpful not only
37 as an entity but for understanding and addressing concerns on distribution of resources within
38 the population; however, to be effective this also needs to be monitored. The aim of these
39 committees could be to prepare the local population for disaster and take leadership in
40 assisting community members at the time of disaster. To be effective, committee members
41 would need external training (provided by government and/or NGOs) at regular intervals on
42 various aspects of disaster preparedness, rescue and relief. Importantly, these committees
43 should consist of a diverse range of community members who are part of the committee at an
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3 equal rank, including women and the elderly. Furthermore, committees should be Government
4 resourced and be in regular contact with government agencies and NGOs operating locally.
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8 **CONCLUSION**

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10 This study has highlighted the challenges facing water-related disaster prone region of
11 Bangladesh. The results confirm previous research that emphasize the vulnerability of
12 communities in the face of inadequate warning systems and poorly coordinated disaster
13 responses, particularly for vulnerable/disadvantaged sectors of the community including the
14 elderly, women, low socioeconomic families and those whose livelihood is rooted in agriculture.
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16 This research calls for increased government investment in systems level responses that
17 empower communities and promote resilience. Further research can support this by addressing
18 the systems level challenges to promoting disaster resilience, and investigating how existing
19 community strengths can be leveraged to implement locally-owned solutions.
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AUTHORS' CONTRIBUTION

JJ, AR, KB and RI conceived the study and its design. AR, FC and KB led the acquisition of study data. KB led the quantitative data analysis. PC, FC and CL performed initial qualitative data analysis. AR, RI, JJ and KB led data interpretation. All authors contributed to manuscript writing critically, for important intellectual content.

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COMPETING INTERESTS

The authors have declared that no competing interests exist. Royal National Lifeboat Institution funded the project with Centre for Injury Prevention and Research, Bangladesh as collaborators and The George Institute for Global Health as academic partners.

DATA SHARING

Requests for access to study data should be addressed to the corresponding author. Data will be made available to the scientific community with as few restrictions as feasible, while retaining exclusive use until the publication of major outputs.

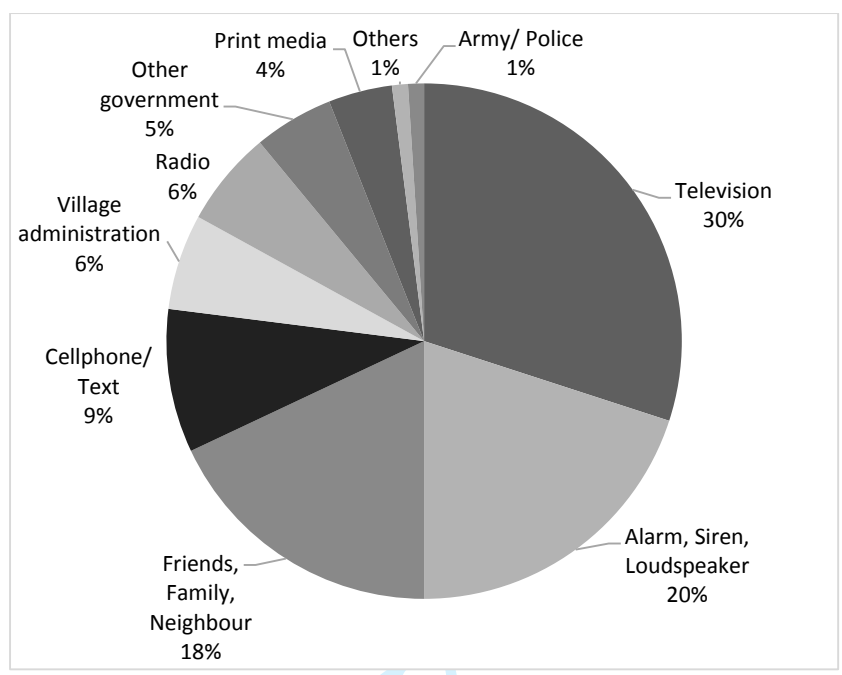
ETHICAL APPROVAL

Ethical clearance for this study was obtained from the University of Sydney, Australia; and Ethical Review Committee – Centre for Injury Prevention and Research Bangladesh.

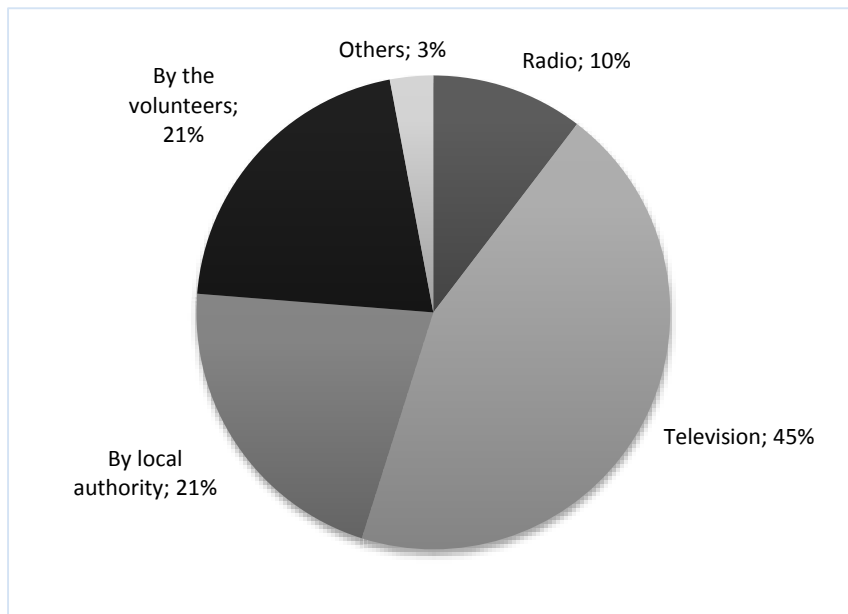
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Context of water related disasters in Bangladesh: A mixed methods study

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Context of water related disasters in Bangladesh: A mixed methods study

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ABSTRACT

Objectives:

To investigate the impact of natural disasters on communities in the Barisal division of Bangladesh, exploring community approaches to disaster preparedness and mitigation.

Setting:

Communities in all districts of the Barisal division of Bangladesh.

Participants:

Quantitative data was collected through a cross-sectional household survey with household heads, mothers and other adults aged 18 years and above (n=9,263 households visited, data collected for n= 38,981 individuals). Qualitative data was collected through in-depth interviews (n=7) and focus group discussions (n=23) with key informants from the community residing in Barisal.

Outcome measures:

Quantitative research recorded features of natural disaster events from the previous five years, documenting risk factors that increase vulnerability to disaster, the use of disaster warning systems, and evacuation processes at the time of disaster. Qualitative research investigated disaster risk perceptions, experiences during and following disaster, and disaster preparedness practices.

Results:

The survey response rate was 94.7%. Exposure to disaster in the last five years was high (82%) with flooding followed by cyclones considered the greatest threats. Awareness of evacuation processes was low, and only 19% of respondents reported evacuating their homes at the time of disaster. Drowning during disaster was the primary concern (87%), followed by debt, livestock and crop loss (78%). The qualitative data amalgamated into four overarching themes: 1) Perceptions and consequences of disaster; 2) Insufficient support for the most vulnerable; 3)

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3 Community preparedness and practices; 4) Barriers to disaster response and improving
4 resilience.
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8 **Conclusions:**
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10 Critical to achieving disaster resilience is increased government investment in infrastructure
11 and systems level responses that empower communities. Further research can support this by
12 addressing the community challenges to promoting disaster resilience, and investigating how
13 existing community strengths can be leveraged to implement locally owned solutions.
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18 **Trial registration:**
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23 **Strengths and Limitations**
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- 25 • To our knowledge, this is the first large scale study reporting on context of disasters,
26 using mixed methods from a LMIC.
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- 28 • This study was conducted in a LMIC prone to water-related disasters and the results
29 may not be generalizable to other LMIC settings; however the qualitative focus group
30 discussions and in-depth interviews spanned a diverse array of participants and yielded
31 rich data that greatly contextualized the cross-sectional survey
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- 34 • Consultations with government representatives are likely to have provided additional
35 insight into existing government initiatives targeted at disaster preparedness and
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INTRODUCTION

Climate-related disasters significantly impact the health, personal security and livelihood of individuals, communities and societies. Between 1998 and 2017, climate-related disasters were the cause of over 1.3 million deaths worldwide, and resulted in a further 4.4 billion people sustaining injuries, becoming homeless, displaced or requiring emergency assistance¹. The impacts of climate related disaster are most severely experienced by those living in low- and middle-income countries (LMICs) who have a higher dependence on natural resources and who are exposed to higher rates of socio-economic disadvantage which prevents the development of coping capacity². One such country is Bangladesh, which is highly prone to flooding due to the annual monsoon rainfalls and extensive low lying floodplains that cover an estimated 80% of the densely populated country³. With a population of over 165 million, it is estimated that more than two thirds of people in Bangladesh live in regions at risk of floods and one quarter live in regions at risk of cyclone⁴. The consequences of flooding in this context include the threat of diarrhoeal disease, lack of access to safe drinking water, loss of housing, livestock, crops, livelihood activities and drowning in floodwaters^{3,4}. Additionally, tropical cyclones are an annual occurrence, which directly contribute to flooding and in turn, drowning-related mortality and morbidity⁴.

There is an increasing global focus on strengthening disaster risk reduction through improved surveillance, information exchange, early warning systems and capacity building in disaster prone countries. From 2005 to 2015, global governments committed to implementing the Hyogo Framework for Action as a guideline for reducing disaster risk through resilience building at both the national and local levels⁵. More recently, the Sendai Framework for Disaster Risk Reduction 2015-2030 was adopted by the United Nations member states in March 2015. The framework represents the next phase of targets and priorities globally, recognising the threat that climate change and disaster risk pose to achieving the Sustainable Development Goals (SDGs)⁶.

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3 The risk of natural disasters in Bangladesh is projected to increase with changing weather
4 patterns associated with extreme vulnerability to climate change³⁴⁷⁸. In the face of growing
5 climate uncertainty, there is an urgent need to understand disaster practices and promote
6 community disaster resilience. In 1991, Cyclone Gorky struck Bangladesh, claiming the lives of
7 138,000 people. This event has spurred improvements in disaster warning systems and
8 increased shelter uptake over the last 20 years⁴⁹ however, there remain considerable
9 challenges in fostering disaster resilience at all levels. Currently, there is only fragmented
10 information available on the consequences of natural disasters in Bangladesh and on existing
11 practices associated with disaster mitigation. Through identifying gaps in current processes,
12 targeted interventions may be implemented to strengthen existing approaches to disaster
13 preparedness, with a focus on disaster risk reduction. Therefore, this study aims to investigate
14 the impact of natural disasters on communities in the Barisal division of Bangladesh, exploring
15 community disaster preparedness, responses to disaster at time of onset, and health seeking
16 behaviours following disaster events. This information is anticipated to contribute to future
17 disaster resilience planning activities for the region.
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32 **METHODS**

33 **Study setting**

34 The Barisal division is located in south central Bangladesh and is comprised of six districts and
35 39 sub-districts (Figure 1). Crossed by numerous rivers, it is highly exposed to flooding due to
36 annual monsoon rains and low lying flood plains.
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43 **Figure 1: Map of the Barisal division of Bangladesh**

44 **Study design**

45 The study used a concurrent mixed methods approach, triangulating cross-sectional household
46 survey data with qualitative in-depth interviews and focus group discussions. Both quantitative
47 and qualitative data were collected as baseline measures of a larger intervention study which
48 aims to significantly reduce drowning rates in the Barisal Division by 2020. As no previous
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3 literature was available regarding Knowledge, Attitude and Practices for disaster resilience from
4 LMICs, a mixed methods approach was used to gain an in-depth understanding of behaviors,
5 perceptions and responses to disaster.
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10 **Patient and Public Involvement**

11 Drowning was identified as a priority health issue through the 2014 Bangladesh Demographic
12 and Health Survey, which collected data from 18,000 residential households nation-wide.¹⁰
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14 Data collection instruments for this present study were developed by the project team in
15 alignment with Bangladesh Health and Injury Survey findings¹¹, designed to investigate notable
16 drowning-related outcomes in greater depth. All data collection tools were trialled with end
17 users prior to their use in this study, investigating their readability, clarity and the relevance of
18 questions included. Study results were triangulated among key informants and consultations
19 and were used to inform the development of pilot interventions for improving water safety and
20 reducing drowning in community settings in Bangladesh.
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30 **MATERIALS AND DATA COLLECTION**

31 **Quantitative**

32 The survey was conducted September 2016 – February 2017 (over a six month period), using a
33 multi-stage cluster sampling method. The survey was conducted as a baseline measure for a
34 larger intervention-based drowning reduction project to be implemented in selected districts of
35 the Barisal division from 2017 to 2020. The sample size (n=385,000) was chosen based on the
36 sample required for the previous Bangladesh Health and Injury Survey¹¹, with the margins of 95%
37 Confidence Intervals providing evidence of sufficient sample size.
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46 Briefly, the sample selected represents all districts within the division. Upazilas from the districts
47 were randomly selected to be included in the project, with further random selection used to
48 identify villages/sites within each upazila for data collection. Within each village, households
49 were selecting using the EPI sampling method¹². The disaster subsample (10%, n=38,981) was
50 selected from the main sampling frame by selecting every household with computer generated
51 ID ending in '0. Questions presented to participants within the disaster sub-sample were
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3 primarily focused on post-disaster practices at the time of disaster to assess the acceptability,
4 reliability and coverage of existing warning systems. The survey questions are available as
5 Supplementary File 1.
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11 Trained data collectors, local to each participating community, used pre-tested structured
12 questionnaires to collect information from household heads, mothers or any adult above 18
13 years through face-to-face interviews. One adult was interviewed per household, who reported
14 data on behalf of all household members. An electronic data capture system (REDCap) was
15 used on tablets for data collection¹³. To ensure data quality and accuracy, trained supervisors
16 observed and checked 10% collected data and re-interviewed 2% of households. The survey
17 consisted of questions on knowledge, attitudes and perceptions/practices for community
18 drowning and disaster risk, and about experiences of natural disaster in the previous five years.
19 Data were collected on demographic characteristics, and on socio-economic status using an
20 index developed for the 2014 Bangladesh Demographic and Health Survey.¹⁰
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31 **Qualitative**

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33 Purposive sampling was used to identify key informants from the community for in-depth
34 interviews and focus group discussions. For inclusion in the study, participants were required to
35 have resided within Barisal for at least six months prior to data collection. Separate male and
36 female discussion groups were arranged to align with cultural practices. The interviews and
37 focus group discussions were semi-structured and conducted by trained research assistants in
38 community locations that were acceptable and accessible to participants. Consent was
39 obtained prior to commencing data collection; interviews lasted between 40-60 minutes, whilst
40 focus group discussions lasted between 1-1.5 hours. The interview and focus group discussion
41 guides included questions related to: 1) disaster risk perceptions; 2) experiences of natural
42 disaster; 3) disaster preparedness practices. Questions aimed to identify examples of good
43 practice in disaster preparedness from community settings to include in future comprehensive
44 disaster resilience planning activities. Further, questions aimed to explore gaps in current
45 disaster preparation, management and relief processes that have potential be addressed
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3 through targeted interventions. Interview and focus group discussion guides are available as
4 Supplementary File 2.
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8 Interviews and focus group discussions were conducted in Bengali, audio-recorded, translated
9 and transcribed in English. To minimise data loss, interviews were jointly translated and
10 transcribed by the interviewing researcher and the translator, and a member of the research
11 team checked the translated transcripts for accuracy. Interviews ceased when saturation of
12 meaning was considered to have occurred.
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18 19 20 **ANALYSIS**

21 **Quantitative**

22 Descriptive analysis (counts and percentages) was performed on variables relating to disaster
23 knowledge, attitudes and behaviour variables. All data were analysed using SAS 9.4 with
24 SAS/STAT 14.2 (SAS Institute, Cary, NC, USA).
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30 **Qualitative**

31 Transcripts were imported into NVivo qualitative data analysis software (QSR International Pty
32 Ltd. V.11, 2015). Content analysis was applied to the transcripts whereby overarching themes
33 were initially developed followed by deductive thematic coding of the data. NVivo was used to
34 arrange the text according to codes and manage the codes in the interpretive phase. Two
35 researchers independently conducted the coding and arrived at consensus on the analyses.
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43 **RESULTS**

44 **Quantitative results**

45 A total of 95,124 households were visited, of which 92,616 household representatives were
46 available for completing the survey (this corresponded to data gathered for n= 385,127
47 individuals; response rate 94.7%). There was an average household size of 4.2 members. For
48 the disaster toll sub- sample of (n=9,263 households visited, data collected for n= 38,981
49 individuals) was completed. There were no meaningful differences in the socio-demographic
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characteristics of the full household survey sample and the disaster subsample (Table 1). All following results reported are for the survey disaster sub-sample. These findings are reported in line with the Consolidated Criteria for Reporting Qualitative Research statement, which supports transparency in reporting qualitative research (Supplementary File 3).

Table 1. Socio-demographics of the full household survey and disaster survey subsample

		Disaster subsample n=38,981 (95%CI)	Full household sample n=385,127, (95%CI)
Age (years)	Infant	2.0% (1.8 - 2.2)	2.0% (1.9 - 2.0)
	1-4	8.1% (7.8 - 8.5)	8.2% (8.0 - 8.3)
	5-9	11.0% (10.7 - 11.4)	10.7% (10.5 - 10.8)
	10-14	10.8% (10.5 - 11.1)	10.7% (10.6 - 10.9)
	15-17	5.9% (5.6 - 6.2)	6.0% (5.9 - 6.1)
	18-24	13.6% (13.1 - 14.1)	14.0% (13.8 - 14.2)
	25-39	24.6% (24.0 - 25.2)	24.1% (23.7 - 24.4)
	40-59	17.1% (16.6 - 17.5)	17.5% (17.3 - 17.7)
	60 +	6.8% (6.4 - 7.1)	6.9% (6.7 - 7.1)
Sex	Male	49.1% (48.5 - 49.8)	49.2% (48.8 - 49.5)
	Female	50.9% (50.2 - 51.5)	50.8% (50.5 - 51.2)
Marital status	Married	50.4% (49.9 - 50.9)	50.6% (50.3 - 51.0)
	Never Married	45.7% (45.2 - 46.2)	45.3% (45.1 - 45.6)
	Divorced	0.3% (0.2 - 0.4)	0.3% (0.3 - 0.4)
	Widow/Widower	3.4% (3.2 - 3.7)	3.5% (3.4 - 3.7)
	Separated	0.2% (0.1 - 0.2)	0.2% (0.2 - 0.2)
Type of family	Nuclear Family	67.5% (65.4 - 69.7)	66.6% (64.8 - 68.3)
	Extended Family	32.5% (30.3 - 34.6)	33.4% (31.7 - 35.2)
Family size	5 or less persons	78.6% (77.0 - 80.3)	78.6% (77.4 - 79.8)
	More than 5 persons	21.4% (19.7 - 23.0)	21.4% (20.2 - 22.6)
Education completed	Not applicable	16.3% (15.4 - 17.3)	16.2% (15.2 - 17.1)
	1 to 5 years	39.9% (38.9 - 40.9)	39.8% (39.0 - 40.7)
	6 to 8 years	17.9% (17.3 - 18.5)	17.6% (17.2 - 18.1)
	9 to 12 years	16.4% (15.6 - 17.3)	16.6% (16.0 - 17.2)
	13 to 17 years	3.7% (3.3 - 4.0)	3.7% (3.4 - 3.9)
	None	5.7% (4.8 - 6.7)	6.1% (5.2 - 7.0)
Maternal education	1 to 5 years	47.9% (46.4 - 49.5)	46.3% (45.1 - 47.5)
	6 to 8 years	20.6% (19.3 - 21.8)	20.5% (19.5 - 21.4)
	9 to 12 years	13.2% (12.1 - 14.4)	14.2% (13.5 - 15.0)
	13 to 17 years	1.5% (1.2 - 1.8)	1.4% (1.3 - 1.6)
	None	16.7% (15.3 - 18.2)	17.6% (16.4 - 18.8)

Monthly income (USD/month)	<80	9.0% (7.9 - 10.2)	9.2% (8.2 - 10.2)
	80-99	16.2% (14.8 - 17.6)	16.8% (15.8 - 17.7)
	100-139	25.8% (24.0 - 27.6)	25.9% (24.5 - 27.2)
	140-179	17.8% (16.4 - 19.2)	17.5% (16.6 - 18.4)
	800+	31.2% (28.6 - 33.7)	30.7% (28.6 - 32.7)
Primary occupation	Agriculture	6.4% (5.8 - 6.9)	6.3% (5.8 - 6.8)
	Business	5.9% (5.5 - 6.2)	5.8% (5.6 - 6.0)
	Student	27.9% (27.4 - 28.5)	27.5% (27.2 - 27.9)
	Domestic work	28.5% (28.1 - 28.8)	28.6% (28.4 - 28.9)
	Service	3.7% (3.4 - 4.1)	3.9% (3.7 - 4.2)
	Not working	3.2% (2.9 - 3.5)	3.3% (3.1 - 3.5)
	Skilled	3.8% (3.5 - 4.0)	3.7% (3.5 - 3.9)
	Unskilled	6.8% (6.3 - 7.3)	7.0% (6.5 - 7.4)
	Other	13.8% (13.4 - 14.3)	13.8% (13.6 - 14.1)

Types of disaster

Using a recall period of five years, the most common natural disaster events experienced by respondents were flooding/flash flooding (43%) and cyclones (35%). The majority of respondents (82%) reported experiencing one or more natural disasters in the previous five years. Of these respondents, two thirds believed flooding/flash flooding to be the greatest threat, followed by cyclones/big storms.

Vulnerability and impact

Respondents were asked which members of the population were most likely to be impacted by natural disasters. Age was considered to be an important factor with older people (23%) and children (19%) considered to be most susceptible. Poor socioeconomic status (21%) was perceived to increase vulnerability to natural disasters. Occupations perceived to be most affected by the natural disaster were farming (32%), labourer jobs (31%) and fishing (20%).

Drowning during disaster was the primary concern for 87% of respondents. Debt, livestock and crop loss were prevailing concerns among the majority of respondents (78%), while just 10% of respondents considered health to be a priority issue during disaster

Risk and protective factors

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3 The survey asked two separate questions with respect to weather forecast and warning signals.
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5 Only 18% of the respondents reported having received any type of weather forecast
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7 information prior to the most recent natural disaster that they had experienced. The most
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9 frequent sources of weather forecast information mentioned were from television (30%), alarm
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11 or loud speakers (20%), and through friends, families or neighbours (18%).
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14 A high proportion of respondents (70%) reported having received warning signals prior to the
15
16 onset of natural disaster. Although almost all households (95%) had at least one member who
17
18 owned a mobile phone, the most common source of warning signal was television (45%)
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20 followed by warnings from local authorities (21%) and volunteers (21%).
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23 The majority of respondents (95%) reported their household roof to be made of tin and only 4%
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25 reported to have a concrete roof. Walls were made of tin for 85% of households and brick and
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27 plaster for 11% of the households.
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30 **Disaster preparedness practices**

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32 Among respondents who reported to have experienced a natural disaster, only 19% evacuated
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34 at the time of the event. Limited money followed by limited time were identified as the two
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36 most common barriers to disaster preparedness (data not shown). Of the 81% of respondents
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38 who reported not evacuating, 44% believed evacuation was not required, 38% believed an
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40 alternative shelter was not easily accessible, 25% did not evacuate due to concerns about the
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42 security of their property and 13% remained to protect livestock. Less than 5% of community
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44 members were aware of evacuation processes or safe evacuation points/places.
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47 Among respondents who had experienced disaster, 22% reported moving to an alternate
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49 shelter during the most recent event. All reported moves were self-initiated with no rescues
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51 required from residences. Cyclone shelters (54%) were used most often used for evacuation
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53 followed by educational institutions (23%), flood shelters (13%), relative's homes (9%) and
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55 community centres (1%).
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Qualitative results

Interviewee characteristics are presented in Table 2. Four focus groups were conducted consisting of two male groups and two female groups, with characteristics presented in Table 3.

Table 2 Characteristics of in-depth interview participants

	Gender	Age range (years)	Occupation	Disaster-related role
P1	M	35-39	Assistant teacher at high school	Opens the doors of the local cyclone centre and escorts people inside
P2	M	30-34	Fisherman and shop owner	Delivers disaster warning signal through mic in village
P3	M	30-34	Agricultural worker	Not specified
P4	M	35-39	Fisherman and labourer	Member of village disaster committee
P5	F	25-29	Assistant teacher at primary school	Opens the doors of the school building and escorts people inside for shelter
P6	F	35-39	Social worker	Educates villagers on disaster preparedness, assists in delivering warning signal, helps vulnerable people evacuate households, leads search parties
P7	F	25-29	Housewife and employee of family planning NGO	Vice president of village disaster committee (administrative role)

Table 3 Characteristics of focus group discussion participants

Gender	Age range (years)	N in each group	Occupation
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FGD1	M	30-60	6	Small business owners, fishermen, shop keepers
FGD2	M	Unknown	6	Business men and fishermen
FGD3	F	25-50	6	Housewives
FGD4	F	25-50	5	Housewives

Four overarching themes emerged from the qualitative data: 1) Perceptions and consequences of disaster; 2) Insufficient support for the most vulnerable (economically, geographically and personal physical attributes); 3) Community preparedness and practices; 4) Barriers to disaster response and improving resilience. The four overarching themes were drawn together from key sub themes which are available in Supplementary File 4, together with illustrative quotes.

Perceptions of risk and consequences of disaster

Community members perceived disasters to not be preventable and viewed disaster-related death as unavoidable, or to occur as a result of “Allah’s will”. There was some acknowledgment of the relationship between water-related disasters and climate uncertainty, which was attributed to the impact of pollution.

“And why these happen, I cannot say. Allah wishes - that’s why it happens brother. Everything happens when Allah wishes.” (P2, M, fisherman and shop owner)

A major concern for community members was the consequences of disaster on agriculture, with erosion and loss of crops and livestock having devastating impacts on livelihood.

“The storm destroyed all the crops. I don’t know whether we will get any rice or not from the grain.” (FGD3, F, housewives)

In particular, loss of livestock was a significant concern for farmers, and the need to protect livestock presented a major impediment to evacuation. Similarly, theft and looting were cited

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3 as both a consequence of disaster and an impediment to evacuation. In terms of health
4 consequences, drowning and illness due to poor sanitation post-disaster were considered to be
5 major contributors to disaster-related morbidity and mortality.
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10 **Insufficient support for the most vulnerable**

11 Respondents frequently reported on the structural weakness of existing dwellings and their
12 inability to withstand a disaster event. A number of personal characteristics were repeatedly
13 associated with increased vulnerability to drowning. Many of these surrounded the notion of
14 'weakness' – an inability to move quickly, hold onto stationary objects when caught in flood
15 waters, swim against currents, climb to safe areas above flood waters, or carry belongings
16 overhead when crossing flood waters. Many of characteristics were specific to women, with
17 traditional clothing worn becoming heavy when wet, or long hair becoming caught on objects
18 preventing escape from flood waters.
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29 *"Women are in risk because they wear many clothes and they have long hair. That hair might be*
30 *untied and get stuck or twisted with anything else. They don't have that much strength. So they*
31 *cannot free themselves."* (FGD2, M, businessmen and fishermen)
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36 Statements were made about the care a woman feels for her children making her a liability to
37 the broader family. There were mentions that women were less able than men to maintain
38 calm or plan rationally in high pressure situations.
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43 **Community preparedness and practices**

44 Participants discussed a number of approaches to preparing their households prior to disaster.
45 These included securing food and valuables in safe, waterproof storage places, reinforcing
46 households with rope and tarp, and creating floatation devices for family members from empty
47 plastic soft drink bottles in case of flooding.
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3 *“We put poles to support the house so that it doesn’t fall. We take a thick rope and tie up one*
4 *end of that rope with the house and tie up the other end of rope with a big tree tightly, so that*
5 *the house doesn’t fall during cyclone.”* (FGD3, F, housewives)
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10 A variety of sources were used to communicate warnings in community settings prior and
11 during disasters. Not all community members owned a TV or radio, and as power is often lost
12 during weather events, loudspeaker announcements in village settings were considered to be
13 most the effective warning signal. These announcements appeared to be predominantly
14 coordinated by NGOs. Warning signals were either based on a 10-point scale which indicates
15 event severity, or were a simple call for evacuation, directing community members towards
16 cyclone shelters and other protected areas of the community. Community members
17 interpreted warning signals in different ways, with individuals having different thresholds for
18 deciding when evacuation was necessary. Previous warnings given for seemingly minor events
19 caused many participants to be skeptical about the urgency of signals.
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30 *“And another thing is people don’t want to go. As long as possible they try to stay in their own*
31 *place. If they have left their things in that place then they might have lost their things. People*
32 *don’t want to leave their resort in their entire life. That’s why problem increases more and*
33 *people get hurt more by drowning in water.”* (FGD1, M, small business owners)
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40 Many drowning deaths were reported to be caused by people evacuating their households
41 after not responding to early warnings. Despite this, evacuation was considered an
42 inconvenience to community members due to difficulties with transporting less-mobile people
43 and the looting that frequently occurs when households are left unattended. One participant
44 reported thieves staging false disaster warning signals for an opportunity to rob empty
45 households.
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50 *“We stay at home because if we leave the house the things will be stolen. We have nothing else*
51 *than these things of the house. That’s why we try to stay at the houses long as we can.”* (P3, M,
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54 agricultural worker)
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Barriers to disaster response and improving resilience

Although there were a number of approaches documented towards disaster preparedness, management and relief, many of these were considered to be unreliable or unsustainable. Many participants discussed disaster management education provided by NGOs in community settings. Although useful, these education programs were reported to be sporadic and with varied content. A lack of resources limited the extent individuals were able implement the practices taught. Consequently, disaster preparedness was predominately managed by individual community members.

Government initiatives were primarily focused on protection at time of disaster and relief post-disaster. A number of cyclone shelters had been built by government in community settings and were frequently used by the most vulnerable members of the community at the time of disaster. Despite this, cyclone shelters were reported to be difficult to access due to unsafe roads and long distances between shelters. Furthermore, shelters were reportedly overcrowded, with poor structural quality, and were potentially unsafe places for women.

“Suppose there are two cyclone centres in our area. Already cracks have been developed in one building. Moreover they become filled up with people at the time when signal is shown.” (FGD2, M, business men and fishermen)

There was a clear lack of faith in governance, with many comments concerning unequal distribution of government relief post-disaster, driven by bribery and nepotism.

“At that time [those] who could give money as bribe he got that house and money. But [those] who actually needed he did not get the house and money.” (FGD1, M, small business owners)

Government post-disaster relief was only available over short periods of time post-event and in some cases, was also provided sporadically by NGOs.

DISCUSSION

This study has highlighted the considerable challenges confronting communities in disaster prone regions of Bangladesh in the face of inadequate warning systems, poor understanding and uptake of evacuation measures, and insufficient relief responses. Each of these challenges are heightened for populations in remote geographical areas and those who are economically deprived. The impacts of disaster presented a heavy burden to communities in terms of housing, economic losses and the threat of drowning and illness. Identifying these issues highlights areas of priority to address through interventions. Increasing commitment from government to address disaster risk was viewed as a crucial step towards reducing disaster-related devastation. As a result, further investigation into policy interventions to improve governance surrounding this issue is required. Further, the need for community to self-manage disaster risk was considered a priority. This study identified several community strengths that could be built upon as part of a comprehensive disaster resilience plan that fosters this approach.

A major impediment identified to effective disaster preparedness was the efficacy of warning systems. Despite high levels of mobile phone penetration in Bangladesh, the majority of survey respondents did not receive warnings through this means and instead relied on television (45%) and warnings from local authorities and volunteers (21%). There was significant heterogeneity in understanding and heeding warning signals, which contributed to a reluctance for evacuation. Warning signal efficacy was impacted by loss of electricity during flooding and poor community confidence in warning systems. This is consistent with the Osti and Nakasu³ review of inadequate warning systems across 10 southern and eastern Asian countries during 21 fatal flood events. The authors reported flood warning systems to be unreliable and the content of warnings to be too technical for community members. Taken together, these findings have critical implications for future research relating to appropriate messaging and the use of mobile technology as an avenue for early warning with high coverage.

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3 There is significant unmet community need for effective disaster response, which must be
4 addressed to move towards ensuring disaster resilience rather than recovery. While
5 communities demonstrated strength with self-reliance, a systems level approach was required
6 to support the development of disaster resilience. There is limited insight into the ongoing
7 mental health effects of disaster and how this impacts community resilience in disaster prone
8 regions ¹⁴. However, the present findings confirm previous research that indicates disaster has a
9 traumatic impact on families and communities. This signifies the need for a mental health
10 workforce that are competent in disaster-related trauma and are responsive to the community
11 in terms of culture, traditions, language and local practices ¹⁵. Further research is critical to
12 understanding the impact of psychological trauma, which women may be more affected by
13 than men, on community disaster resilience
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25 At the community level, there was considerable concern for preserving agriculture and
26 ultimately livelihoods. Protecting livestock was cited as a major barrier to evacuation and a
27 significant contributor to disaster vulnerability, with 78% of survey participants reporting
28 prevailing concerns about debt, livestock and crop loss at the time of a disaster event.
29 Individual and community level factors were key contributors to vulnerability, in particular
30 house construction, age and gender.
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38 Women were perceived to be more vulnerable than men, which was consistent with previous
39 research ^{9 16}; however in high income settings, men have a higher mortality attributed to flood
40 related-drowning ¹⁷. This is indicative of the “socially determined” role of women in many
41 LMICs and is aligned with an emerging focus in disaster literature on the role of women and
42 how this contributes to vulnerability ^{9 14 16}. In Bangladesh, this is related to the socioeconomic
43 status of women, health status and perpetration of violence against women ¹⁶. A cross-
44 sectional survey with mothers spanning two floods in Bangladesh in 2007, reported 86% of
45 women experienced intimate partner violence (physical, emotional, sexual and sustenance
46 abuse) during a flood ¹⁸. This study also reported that both unintentional injury (cuts, falls,
47 drowning etc.) and parental violence against children is increased during flooding disaster ¹⁸.
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3 Perpetration of parental violence (physical, emotional and sustenance abuse) against children
4 was highest in low socioeconomic families, in families with household unemployment and
5 among mothers; particularly mothers engaged in domestic work (not employed) and those
6 experiencing intimate-partner violence, all of which related to the extreme survival pressure.
7 While women are seen as vulnerable to disaster and disaster-related trauma, there is great
8 opportunity to empower and educate women in disaster preparedness and management
9 practices to promote community resilience.¹⁴
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18 Natural disasters have a number of long-term indirect impacts on vulnerable populations.
19 Communities repeatedly exposed to disasters may experience forced migration, either to urban
20 centres or onto other hazard prone land.¹⁹ This contributes to rising land pressure, rapid
21 urbanisation and a breakdown of community and social structures which disproportionately
22 affects the poorest members of the population, increasing marginalisation.²⁰ A lack of stability
23 and security establishes a poverty cycle²¹ and enhances existing issues surrounding gender and
24 social inequality.²² The under- age marriage and trafficking of young girls has been reported to
25 increase following disaster as children lose their parents, parents are unable to afford
26 education due to disaster repair costs, or as schools are destroyed during disaster, impacting
27 social-determinants of health adversely.²³
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38 **Implication for practice**

39 **Improve commitment from government**

40 Given the population density and scarce resources in the context, greater investment in
41 preparedness and education rather than management and recovery is needed in Bangladesh.
42 Disaster management was primarily undertaken by the NGOs/ multi- laterals, which was
43 reported to be inconsistent. There is a need for improved coordination between relevant
44 government agencies and NGOs to: 1) prevent overlap of interventions in certain areas and
45 support areas/communities currently without any interventions; 2) ensure the interventions
46 available are consistent and offered to a high standard; 3) ensure post-disaster aid is distributed
47 using regulated processes to areas of most need; and 4) ensure allocation of funding is fair and
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3 appropriate governance mechanisms in place for distribution of support. Indeed Government
4 investment is essential to obtaining resources to improve basic public infrastructure (roads,
5 dams and river embankments), constructing protective infrastructure, such as cyclone shelters
6 and for improving the availability of emergency medical care post-disaster. In Bangladesh,
7 increased Government ownership and coordination could see considerable gains, however
8 better engagement with stakeholders at the community and policy level is needed to ensure a
9 community owned approach to promoting disaster resilience.
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18 **Build resilient communities by enabling self-management of disaster risk**

19 All initiatives implemented should focus on empowering communities to mitigate disaster risk
20 locally. This will assist in the promotion of cost-effective, local approaches to disaster
21 preparedness, such as homemade personal floatation devices made from community sourced
22 and readily available materials. The findings report on how communities/society in rural
23 Bangladesh have organized themselves to increase resilience and manage disasters more
24 effectively.
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32 Participants reported not using cyclone shelters, however over-crowding of shelters was also
33 reported as a deterrent. Community ownership with respect to consultation on shelter location,
34 feasibility and usability of infrastructure to access shelters might address some of the mistrust
35 in governance/disaster management. This may be aided by building and using community
36 infrastructures such as schools or mosques as disaster shelters, which would be an efficient and
37 acceptable use of resources. Finally, whilst the community reported poor access to health
38 services generally, this was compounded during disasters when it was clear that the health
39 systems were non-existent; the need for resilient health systems cannot be over-stated.
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49 Resilience will also depend upon the capacity of disaster management practices to be adjusted
50 in a timely manner, in response to changing community priorities and the changing local
51 environment. There should be a focus on reducing internal community conflicts caused by the
52 provision of external resources to promote cohesive, united, community-based response to
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3 disaster. This would be aided by formal disaster committees, which would be helpful not only
4 as an entity but for understanding and addressing concerns on distribution of resources within
5 the population; however, to be effective this also needs to be monitored. The aim of these
6 committees could be to prepare the local population for disaster and take leadership in
7 assisting community members at the time of disaster. To be effective, committee members
8 would need external training (provided by government and/or NGOs) at regular intervals on
9 various aspects of disaster preparedness, rescue and relief. Importantly, these committees
10 should consist of a diverse range of community members who are part of the committee at an
11 equal rank, including women and the elderly. Furthermore, committees should be Government
12 resourced and be in regular contact with government agencies and NGOs operating locally.
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23 **Strengths and limitations**

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25 To our knowledge, this is the first large scale study reporting on the context of natural disasters, using
26 mixed methods, from a LMIC. The qualitative research performed spanned a diverse range of
27 participants and yielded rich data that greatly contextualized the cross-sectional survey. As the study
28 was conducted in a country prone to water-related disasters, the results may not be generalizable to
29 other LMIC settings. Secondly, the recall period was relatively large with 5 years which may influence
30 the reliability of the findings. Consultations with government representatives are likely to have provided
31 additional insight into existing government initiatives targeted at disaster preparedness and response,
32 highlighting strengths and gaps in existing disaster mitigation policies.
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41 **CONCLUSION**

42 This study has highlighted the challenges facing water-related disaster prone region of
43 Bangladesh. The results confirm previous research that emphasize the vulnerability of
44 communities in the face of inadequate warning systems and poorly coordinated disaster
45 responses, particularly for vulnerable/disadvantaged sectors of the community including the
46 elderly, women, low socioeconomic families and those whose livelihood is rooted in agriculture.
47 This research calls for increased government investment in systems level responses that
48 empower communities and promote resilience. Further research can support this by addressing
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3 the systems level challenges to promoting disaster resilience, and investigating how existing
4 community strengths can be leveraged to implement locally-owned solutions.
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29 **AUTHORS' CONTRIBUTION**

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31 JJ, AR, KB and RI conceived the study and its design. AR, FC and KB led the acquisition of study
32 data. KB led the quantitative data analysis. PC, FC and CL performed initial qualitative data
33 analysis. AR, RI, JJ and KB led data interpretation. All authors contributed to manuscript writing
34 critically, for important intellectual content.
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40 **FUNDING STATEMENT**

41
42 The study was funded by the Royal National Lifeboat Institution, conducted with the support of
43 Mr Steve Wills (Head of International Programmes) and Mr Dan Ryan (International Research
44 Manager). The corresponding author had full access to all the data in the study and had final
45 responsibility for the decision to submit for publication.
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50 **COMPETING INTERESTS**

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3 The authors have declared that no competing interests exist. Royal National Lifeboat Institution
4 funded the project with Centre for Injury Prevention and Research, Bangladesh as collaborators
5 and The George Institute for Global Health as academic partners.
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10 **DATA SHARING**

11 Requests for access to study data should be addressed to the corresponding author. Data will
12 be made available to the scientific community with as few restrictions as feasible, while
13 retaining exclusive use until the publication of major outputs.
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19 **ETHICAL APPROVAL**

20 Ethical clearance for this study was obtained from the University of Sydney, Australia; and
21 Ethical Review Committee – Centre for Injury Prevention and Research Bangladesh.
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27 **ACKNOWLEDGEMENTS**

28 The authors acknowledge the field staff employed through the Centre for Injury Prevention and
29 Research, Bangladesh who conducted all quantitative and qualitative data collection. The
30 authors also acknowledge Ms Aliko Christou, for her contributions to manuscript preparation.
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Image 1: Map for study area- Barisal division, Bangladesh

30x22mm (300 x 300 DPI)

COREQ (COnsolidated criteria for REporting Qualitative research) Checklist

A checklist of items that should be included in reports of qualitative research. You must report the page number in your manuscript where you consider each of the items listed in this checklist. If you have not included this information, either revise your manuscript accordingly before submitting or note N/A.

Topic	Item No.	Guide Questions/Description	Reported on Page No.
Domain 1: Research team and reflexivity			
<i>Personal characteristics</i>			
Interviewer/facilitator	1	Which author/s conducted the interview or focus group?	
Credentials	2	What were the researcher's credentials? E.g. PhD, MD	
Occupation	3	What was their occupation at the time of the study?	
Gender	4	Was the researcher male or female?	
Experience and training	5	What experience or training did the researcher have?	
<i>Relationship with participants</i>			
Relationship established	6	Was a relationship established prior to study commencement?	
Participant knowledge of the interviewer	7	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	
Interviewer characteristics	8	What characteristics were reported about the interviewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	
Domain 2: Study design			
<i>Theoretical framework</i>			
Methodological orientation and Theory	9	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	
<i>Participant selection</i>			
Sampling	10	How were participants selected? e.g. purposive, convenience, consecutive, snowball	
Method of approach	11	How were participants approached? e.g. face-to-face, telephone, mail, email	
Sample size	12	How many participants were in the study?	
Non-participation	13	How many people refused to participate or dropped out? Reasons?	
<i>Setting</i>			
Setting of data collection	14	Where was the data collected? e.g. home, clinic, workplace	
Presence of non-participants	15	Was anyone else present besides the participants and researchers?	
Description of sample	16	What are the important characteristics of the sample? e.g. demographic data, date	
<i>Data collection</i>			
Interview guide	17	Were questions, prompts, guides provided by the authors? Was it pilot tested?	
Repeat interviews	18	Were repeat interviews carried out? If yes, how many?	
Audio/visual recording	19	Did the research use audio or visual recording to collect the data?	
Field notes	20	Were field notes made during and/or after the interview or focus group?	
Duration	21	What was the duration of the interviews or focus group?	
Data saturation	22	Was data saturation discussed?	
Transcripts returned	23	Were transcripts returned to participants for comment and/or	

Topic	Item No.	Guide Questions/Description	Reported on Page No.
		correction?	
Domain 3: analysis and findings			
<i>Data analysis</i>			
Number of data coders	24	How many data coders coded the data?	
Description of the coding tree	25	Did authors provide a description of the coding tree?	
Derivation of themes	26	Were themes identified in advance or derived from the data?	
Software	27	What software, if applicable, was used to manage the data?	
Participant checking	28	Did participants provide feedback on the findings?	
<i>Reporting</i>			
Quotations presented	29	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	
Data and findings consistent	30	Was there consistency between the data presented and the findings?	
Clarity of major themes	31	Were major themes clearly presented in the findings?	
Clarity of minor themes	32	Is there a description of diverse cases or discussion of minor themes?	

Developed from: Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 2007. Volume 19, Number 6: pp. 349 – 357

Once you have completed this checklist, please save a copy and upload it as part of your submission. DO NOT include this checklist as part of the main manuscript document. It must be uploaded as a separate file.

BHASA (AFLOAT)

Baseline Survey Questionnaire

Question	Respondent's answer																								
Section G - Natural Disaster Details অধ্যায় G এর জন্য সাক্ষাৎকারে অংশগ্রহণকারী উত্তরদাতার নাম																									
উত্তরদাতার নাম (অধ্যায়-জি) Name of respondent interviewed for Section G নাম																									
আপনি কি কি ধরনের প্রাকৃতিক দুর্যোগের কথা জানেন? How many kinds of natural disasters can you think of? একাধিক উত্তর হতে পারে Multiple responses possible কি কি ধরনের প্রাকৃতিক দুর্যোগের	<table border="1"> <tr> <td>1</td> <td>সাইক্লোন/বড় ধরনের ঝড় Cyclones/big storms</td> <td>5</td> <td>রোগ Disease</td> </tr> <tr> <td>2</td> <td>বন্যা Flooding</td> <td>99</td> <td>জানিনা Don't know</td> </tr> <tr> <td>3</td> <td>সুনামি Tsunami</td> <td>97</td> <td>অন্যান্য (উল্লেখ করুন) Others (specify)</td> </tr> <tr> <td>4</td> <td>ভূমিধস Landslide</td> <td></td> <td></td> </tr> </table>	1	সাইক্লোন/বড় ধরনের ঝড় Cyclones/big storms	5	রোগ Disease	2	বন্যা Flooding	99	জানিনা Don't know	3	সুনামি Tsunami	97	অন্যান্য (উল্লেখ করুন) Others (specify)	4	ভূমিধস Landslide										
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4	দুর্যোগগুলো কি কি? (সর্বশেষ ঘটনা)	6	ভারী বর্ষন/অতি বৃষ্টি Heavy rainfall
5	What was the third most recent disaster event you	2	সাইক্লোন/বড় ধরনের ঝড় Cyclone
6	have experienced?	7	কালবৈশাখী Nor
7		8	নদী ভাঙ্গন Riverbank erosion
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14	Others (Specify)		
15	তখন আপনি কোন সতর্কবার্তা (দুর্যোগের সতর্কবার্তা)	1	হ্যাঁ Yes
16	শুনেছিলেন কি?	2	না No
17		90	মনে নেই Can't remember
18	Did you receive any warning message for the most		
19	recent disaster you experienced?		
20	সতর্কবার্তা শুনেছিলেন		
21	হ্যাঁ হলে, কোথায় থেকে দুর্যোগের সতর্কবার্তা	1	রেডিও Radio
22	শুনেছিলেন ?	2	টেলিভিশন Television
23		3	স্থানীয় প্রশাসনের প্রচারণা Announcement by local authority
24	If yes, where did you get the message from?	4	স্বৈচ্ছাসেবীদের প্রচারণা যেমন রেডক্রিসেন্ট/ফায়ার সার্ভিস ও সিভিল ডিফেন্স
25	কোথা থেকে শুনেছিলেন		Announcement by the volunteers (Red crescent, fire service and civil defence etc)
26		97	অন্যান্য (উল্লেখ করুন) Others (specify)
27			
28			
29			
30			
31	অন্যান্য (উল্লেখ করুন)		
32	Others (Specify)		
33	দুর্যোগের সময় আপনারা কি কাছাকাছি কোন দুর্যোগ	1	হ্যাঁ Yes
34	সেন্টারে আশ্রয় নিয়েছিলেন?	2	না No
35	During the last disaster did you and your household		
36	members move to a nearby shelter?		
37	কোথাও আশ্রয় নিয়েছিলেন		
38	হ্যাঁ হলে কে / কারা আশ্রয় কেন্দ্রের ব্যবস্থা করেছে?	1	নিজ উদ্যোগে গিয়েছি Self-initiative
39	If yes, who put in place/organised the shelter?	4	এন জি ও NGO
40	কারা ব্যবস্থা করেছে	2	সরকারী আশ্রয় কেন্দ্র Government Shelter
41		97	অন্যান্য (উল্লেখ করুন) Others (specify)
42		3	স্থানীয় প্রশাসন Local Administration
43		99	জানি না Don't know
44		90	মনে নেই Can't remember
45	অন্যান্য (উল্লেখ করুন)		
46	Others (Specify)		
47	তখন আপনি কোথায় গিয়েছিলেন?	1	বন্যার্তদের জন্য সহায়তা কেন্দ্রে ^a Flood shelter
48	What type of centre did you go to?	4	কমিউনিটি কেন্দ্রে Community centre
49		2	সাইক্লোন শেল্টারে Cyclone shelter
50	কোথায় গিয়েছিলেন	5	আত্মীয়র বাড়িতে Relatives homes
51		3	শিক্ষা প্রতিষ্ঠানে Educational institution
52		99	জানি না Don't know
53			
54	প্রধানত কি কারণে আপনি আশ্রয় কেন্দ্রে যেতে পারেন	1	প্রয়োজনে মনে করিনি Did not think it was needed
55	নি ?	4	এ ধরনের দুর্যোগ প্রায়ই হয় Disaster is a common phenomenon
56	What is the primary reason you did not go to the	2	বাড়ীর জিনিস-পত্রের নিরাপত্তার কথা চিন্তা করে For the security of property
57	shelter/centre?	5	সাইক্লোন শেল্টার বেশ দূরে Shelter is far away
58	কি কারণে যেতে পারেন নি	3	গবাদী পশু ফেলে রেখে যাইনি To protect household cattle
59		97	অন্যান্য (উল্লেখ করুন) Others (specify)
60			

1 2 3 4 5 6 7 8 9 10	অন্যান্য (উল্লেখ করুন) Others (Specify) এ এলাকায় সাধারণত যে ধরনের অসুখ-বিসুখ হয় সে তুলনায় পানিতে ডুবা প্রতিরোধে কাজ করাটা কতটা গুরুত্বপূর্ণ বলে মনে করেন? [একটি উত্তর দিতে পরামর্শ করুন] Compared to other health problems you or your area face, how big a priority is it to reduce the risks associated with disasters that can lead to drowning? [Prompt for one response] গুরুত্বপূর্ণ বলে মনে করেন	1 2 3	1 তেমন গুরুত্বপূর্ণ নয় Low priority 2 কিছুটা গুরুত্বপূর্ণ Medium priority 3 অতি গুরুত্বপূর্ণ High priority		
11 12 13 14 15 16 17 18 19 20 21 22	(উত্তর বলে দিবেন না, উত্তরদাতাকে সবচেয়ে বেশি ক্ষতি হয়েছে এমন তিনটি বিষয় নির্বাচন করুন Do not prompt, give the respondent time to think and mark up to 3 options) আপনার মতে এসকল প্রাকৃতিক দুর্যোগে কি ধরনের ক্ষতি সবচেয়ে বেশি হয়ে থাকে? What were the main effects of the most recent natural disaster you experienced?	1 2 3 4 5	1 ইনজুরিজনিত অসুস্থতা Injury morbidity 2 মৃত্যু Death 3 ঘর-বাড়ী ধসে পড়ে Damage to infrastructure 4 মূল্যবান সম্পদের ক্ষতি Loss of productive assets 5 ফসলের ক্ষতি Loss of crops	6 7 8 9	আয় কমে যাওয়া Loss of income গবাদী পশু হারিয়ে যায়/মারা যায় Loss of livestock ঋণ গ্রস্ত হয়ে যায় Debt বিভিন্ন অসুখ-বিসুখ Disease
23 24 25 26 27 28 29 30 31 32 33	আপনার মতে এসকল প্রাকৃতিক দুর্যোগে কি ধরনের ক্ষতি সবচেয়ে বেশি হয়ে থাকে? What were the main effects of the most recent natural disaster you experienced?	1 2 3 4 5	1 ইনজুরিজনিত অসুস্থতা Injury morbidity 2 মৃত্যু Death 3 ঘর-বাড়ী ধসে পড়ে Damage to infrastructure 4 মূল্যবান সম্পদের ক্ষতি Loss of productive assets 5 ফসলের ক্ষতি Loss of crops	6 7 8 9	আয় কমে যাওয়া Loss of income গবাদী পশু হারিয়ে যায়/মারা যায় Loss of livestock ঋণ গ্রস্ত হয়ে যায় Debt বিভিন্ন অসুখ-বিসুখ Disease
34 35 36 37 38 39 40 41 42 43 44	আপনার মতে এসকল প্রাকৃতিক দুর্যোগে কি ধরনের ক্ষতি সবচেয়ে বেশি হয়ে থাকে? What were the main effects of the most recent natural disaster you experienced?	1 2 3 4 5	1 ইনজুরিজনিত অসুস্থতা Injury morbidity 2 মৃত্যু Death 3 ঘর-বাড়ী ধসে পড়ে Damage to infrastructure 4 মূল্যবান সম্পদের ক্ষতি Loss of productive assets 5 ফসলের ক্ষতি Loss of crops	6 7 8 9	আয় কমে যাওয়া Loss of income গবাদী পশু হারিয়ে যায়/মারা যায় Loss of livestock ঋণ গ্রস্ত হয়ে যায় Debt বিভিন্ন অসুখ-বিসুখ Disease
45 46 47 48 49 50 51 52 53 54 55	এই প্রাকৃতিক দুর্যোগে আপনার এলাকায় অবকাঠামোগত/ পরিবেশগত কি ধরনের ক্ষতি সবচেয়ে বেশি হয়েছে? What parts of your community infrastructure or environment are most affected by this natural disaster? (উত্তর বলে দিবেন না, উত্তরদাতাকে সবচেয়ে বেশি ক্ষতি হয়েছে এমন তিনটি বিষয় বলতে বলুন Do not prompt; select 3 most affected) অবকাঠামোগত ক্ষতি	1 2 3 4 5 6	1 ঘর-বাড়ি Houses 2 কৃষি জমি/ফসল Farmland 3 মাছ ধরার সামগ্রী Fishing resources 4 গাছ-পালা/বাগান Trees/forests/orchards 5 বিদ্যালয়- Schools 6 স্বাস্থ্য কেন্দ্র/ চিকিৎসা কেন্দ্র Health facilities	7 8 9 99 97	পানি ও পয়ঃনিষ্কাশন ব্যবস্থা Water and sanitation facilities রাস্তা- ঘাট Roads ব্রীজ/কালভার্ট Bridges জানি না Don't know অন্যান্য (উল্লেখ করুন) Other
56 57	অন্যান্য (উল্লেখ করুন)Others (Specify)				
58 59 60	এই প্রাকৃতিক দুর্যোগে আপনার এলাকার কোন ধরনের পেশাজীবীরা সবচেয়ে বেশি ক্ষতিগ্রস্ত? What kind of work or jobs in this area are most affected by this natural disaster? উত্তর বলে দিবেন না, উত্তরদাতার দেয়া প্রযোজ্য সব	1 2	1 জেলে Fisherman 2 মাঝি Boatman	6 7	ব্যবসায়ী Shopkeeper/businessman সরকারী চাকরীজীবী Government employee

<p>কয়টি উত্তর নির্বাচন করুন (Do not prompt; select as many as apply) পেশাজীবীদের ক্ষতি</p>	<table border="1"> <tr> <td>3</td> <td>রাখাল Livestock herder</td> <td>8</td> <td>পুলিশ/সামরিক বাহিনীর সদস্য Police/army</td> </tr> <tr> <td>4</td> <td>কৃষক Farmer</td> <td>99</td> <td>জানি না Don't know</td> </tr> <tr> <td>5</td> <td>দিন মজুর Wage labourer</td> <td>97</td> <td>অন্যান্য (উল্লেখ করুন) Other</td> </tr> </table>	3	রাখাল Livestock herder	8	পুলিশ/সামরিক বাহিনীর সদস্য Police/army	4	কৃষক Farmer	99	জানি না Don't know	5	দিন মজুর Wage labourer	97	অন্যান্য (উল্লেখ করুন) Other																													
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13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28	প্রাকৃতিক দুর্যোগকালীন জরুরী সতর্কবার্তা প্রচারের জন্য আপনার কাছে কোন পদ্ধতি বেশী কার্যকর বলে মনে হয়? In the event of a natural disaster, what is your preferred method of receiving emergency alert information? (শীর্ষ ৩টি উত্তর চিহ্নিত করুন) (Mark top 3 choices) জরুরী সতর্কবার্তা প্রচারে কোন পদ্ধতি বেশী কার্যকর	1 2 3 4 5 6 7 8 9 97	টেলিভিশন Television রেডিও Radio সংবাদপত্র/পত্রিকা Print Media বন্ধু-বান্ধবী/ পরিবারের সদস্য Friends/Family প্রতিবেশী Neighbors স্থানীয় দুর্যোগ ব্যবস্থাপনা কমিটি Local level disaster management committee স্থানীয় এনজিও Local NGOs স্বচ্ছাসেবী প্রতিষ্ঠান যেমন- রেড ক্রিসেন্ট সোসাইটি, স্কাউট-Voluntary organizations: Red Crescent society, Scouts মোবাইল/ম্যাসেজ Cell phones/text alerts অন্যান্য (উল্লেখ করুন) Other (specify)
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37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54	প্রাকৃতিক দুর্যোগকালীন কিভাবে ঘর-বাড়ী, নিজে এবং পরিবারের সদস্যদের নিরাপদ রাখতে হবে সে বিষয়ে কখনো কোন তথ্য পেয়েছেন কি? Have you ever received any information on how to keep your household/members safe during a natural disasters? নিরাপদ রাখতে তথ্য পেয়েছেন কি	1 2	হ্যাঁ Yes না No
55 56 57 58 59 60	হ্যাঁ হলে, কোথায় থেকে এই তথ্য পেয়েছেন? If yes, from where did you receive this information from? (শীর্ষ ৩টি উত্তর চিহ্নিত করুন) (Mark top 3 choices) কোথায় তথ্য পেয়েছেন	1 2 3 4 5 6 7 8 9 10 97	টেলিভিশন Television রেডিও Radio সংবাদপত্র/পত্রিকা Newspaper গনমাধ্যম (লিফলেট ইত্যাদি) Print Media (pamphlet/flyer) বন্ধু-বান্ধবী/ পরিবারের সদস্য Friends/Family প্রতিবেশী Neighbors গণ্যমান্য ব্যক্তি/ধর্মীয় নেতা (ইমাম/পুরোহিত/ঠাকুর) Community leaders/Religious leaders মাঠকর্মী Outreach worker স্বাস্থ্যকর্মী Community health workers এনজিও কর্মী NGO workers অন্যান্য (উল্লেখ করুন) Other (Specify)
	অন্যান্য (উল্লেখ করুন)Others (Specify)		
	আপনার মতে, সংকটকালীন সময় সেবা ও তথ্য পাবার সম্ভাব্য বাধা/সমস্যাগুলো কি? What do you believe are potential barriers/problems to accessing emergencies services and information?	1 2 3	তথ্যের অভাব Lack of information করণীয় সম্পর্কে জ্ঞানের অভাব Lack of knowledge of what to do বর্তমান অবস্থান সম্পর্কে জ্ঞান না থাকা Lack of knowledge of current location

<p>(উত্তরদাতা যে কয়টি বলবে, সবক'টি বৃত্তায়িত করুন Select all that apply) সম্ভাব্য বাধা/সমস্যাগুলো কি</p>	<table border="1"> <tr> <td>4</td> <td>প্রাকৃতিক দুর্যোগের অবস্থান সম্পর্কে তথ্য না জানা এবং সম্ভাব্য গতিপথ সম্পর্কে ধারণা না থাকা Lack of knowledge where the natural disaster is located and/or where it is heading</td> </tr> <tr> <td>5</td> <td>যানবাহনের অভাব Lack of transportation</td> </tr> <tr> <td>6</td> <td>সম্পত্তির নিরাপত্তা Property security</td> </tr> <tr> <td>7</td> <td>ব্যক্তিগত নিরাপত্তা Personal safety</td> </tr> <tr> <td>97</td> <td>অন্যান্য (উল্লেখ করুন) Other (specify)</td> </tr> </table>	4	প্রাকৃতিক দুর্যোগের অবস্থান সম্পর্কে তথ্য না জানা এবং সম্ভাব্য গতিপথ সম্পর্কে ধারণা না থাকা Lack of knowledge where the natural disaster is located and/or where it is heading	5	যানবাহনের অভাব Lack of transportation	6	সম্পত্তির নিরাপত্তা Property security	7	ব্যক্তিগত নিরাপত্তা Personal safety	97	অন্যান্য (উল্লেখ করুন) Other (specify)												
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<p>আপনি কি মনে করেন আপনার বাড়ী একটি প্রাকৃতিক দুর্যোগ মোকা বেলায় প্রস্তুত কি না? Do you feel your household is well prepared to handle a natural disaster? দুর্যোগ মোকাবেলায় প্রস্তুত</p>	<table border="1"> <tr> <td>1</td> <td>হ্যাঁ Yes</td> </tr> <tr> <td>2</td> <td>না No</td> </tr> </table>	1	হ্যাঁ Yes	2	না No																		
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<p>আপনি যদি একটি প্রাকৃতিক দুর্যোগ মোকাবিলা করতে প্রস্তুত না হন, তবে এর কারণ নিচের কোনটি? What are the major reasons you don't feel prepared? (পড়ে শোনান;যতগুলো প্রয়োজন নির্বাচন করুন Read out, select all that apply) প্রস্তুত না হওয়ার কারণ</p>	<table border="1"> <tr> <td>1</td> <td>প্রস্তুত হতে অনেক সময়ের প্রয়োজন Takes too much time to become prepared</td> </tr> <tr> <td>2</td> <td>প্রস্তুত হতে অনেক টাকার প্রয়োজন Takes too much money to become prepared</td> </tr> <tr> <td>3</td> <td>কিভাবে প্রস্তুত হতে হবে তা জানা নেই Don't know how to prepare</td> </tr> <tr> <td>4</td> <td>মনে হয় প্রস্তুত হলেও তা ফলপ্রসূ হবে না Feel that preparing would not be effective</td> </tr> <tr> <td>5</td> <td>আমার অগ্রাধিকারের তালিকায় এটা আগের বিষয় নয় It's not high on my list of priorities</td> </tr> <tr> <td>6</td> <td>এখানে প্রাকৃতিক দুর্যোগ হবে বলে মনে করি না Don't think that disaster will occur here</td> </tr> <tr> <td>97</td> <td>অন্যান্য (উল্লেখ করুন) Other (specify)</td> </tr> </table>	1	প্রস্তুত হতে অনেক সময়ের প্রয়োজন Takes too much time to become prepared	2	প্রস্তুত হতে অনেক টাকার প্রয়োজন Takes too much money to become prepared	3	কিভাবে প্রস্তুত হতে হবে তা জানা নেই Don't know how to prepare	4	মনে হয় প্রস্তুত হলেও তা ফলপ্রসূ হবে না Feel that preparing would not be effective	5	আমার অগ্রাধিকারের তালিকায় এটা আগের বিষয় নয় It's not high on my list of priorities	6	এখানে প্রাকৃতিক দুর্যোগ হবে বলে মনে করি না Don't think that disaster will occur here	97	অন্যান্য (উল্লেখ করুন) Other (specify)								
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1		5	ব্যাটারী চালিত রেডিও Battery operated radio		
2		6	ব্যাটারী Batteries		
3		7	টর্চলাইট Flashlight		
4		8	প্রাথমিক চিকিৎসা সরঞ্জাম First Aid Kit		
5		9	জেনারেটর Generator		
6		10	কম্বল Blankets		
7		12	এগুলোর কোনোটাই আমার নেই I don't have any of these items		
11	[যদি নিরাপদে সরে যাবার স্থান নির্বাচিত থাকে] নিরাপদে সরে যাবার স্থানটি কোথায়? [If evacuation point selected] Where is the evacuation point? উত্তর বলে দিবেন না, উত্তরদাতার দেয়া প্রযোজ্য সব কয়টি উত্তর নির্বাচন করুন Do not prompt, select all that apply স্থানটি কোথায়	1	ঝড় আশ্রয়কেন্দ্র Storm shelter	4	বড় ঘর Big house
12		2	মসজিদ Mosque	5	উঁচু জমি High ground
13		3	স্কুল/কলেজ School/College	99	জানি না Don't know
14				97	অন্যান্য (উল্লেখ করুন) Others, specify
15	অন্যান্য (উল্লেখ করুন)Others (Specify)				
22	[If evacuation point selected] [যদি নিরাপদে সরে যাবার স্থান নির্বাচিত থাকে] এলাকাটি কতটুকু নিরাপদ বলে আপনি মনে করেন? How safe do you think this area is? (একটি নির্বাচন করুন Prompt, select one) কতটুকু নিরাপদ	1	নিরাপদ নয় Unsafe	3	নিরাপদ Safe
23		2	মোটামুটি নিরাপদ Somewhat safe	4	নিশ্চিত নয় Not sure
28	এই (প্রাকৃতিক দুর্যোগের) পূর্বাভাস পাবার পরও আপনার পরিবারের কিছু বা সকল সদস্যও নিরাপদ স্থানে সরে না যাবার কি কোনো কারণ আছে? Are there any reasons why some or all of your household members did not evacuate when you heard the most recent natural disaster was forecast? (উত্তর বলে দিবেন না, উত্তরদাতা যে কয়টি বলবে, সবকটি বৃত্তায়িত করুন Do not prompt, select all that apply) নিরাপদ স্থানে সরে না যাবার কারণ	1	এখানেই যথেষ্ট নিরাপদ Safe enough here		
29		2	নিরাপদে সরে যেতে প্রচুর অর্থ বা সময়ের প্রয়োজন Too expensive or time-consuming to evacuate		
30		3	সরে যেতে ভয় হয় Afraid to leave		
31		4	সম্পত্তি দেখাশোনা করার জন্য থাকতে হবে Need to stay to look after property		
32		5	পূর্বাভাসের উপর ভরসা নেই Forecasts are not reliable		
33		6	না, আমরা সবাই নিরাপদ স্থানে সরে যাবো No, we would all evacuate		
34		99	জানি না Don't know		
35		97	অন্যান্য (উল্লেখ করুন) Other (specify)		
41	অন্যান্য (উল্লেখ করুন)Others (Specify)				
43	এই প্রাকৃতিক দুর্যোগে যদি আপনার খানায় ক্ষতি হয়, তাহলে আপনি সাহায্যের জন্য কার উপর ভরসা করবেন? If your household suffered as a result of [this natural disaster], who could you rely on to help you? (উত্তর বলে দিবেন না, উত্তরদাতা যে কয়টি বলবে, সবকটি বৃত্তায়িত করুন Do not prompt, select all that apply) সাহায্যের জন্য কার উপর ভরসা করবেন	1	বন্ধু বা প্রতিবেশী Friends or neighbours		
44		2	আত্মীয় - স্বজন Relatives		
45		3	এলাকার সম্ভ্রান্ত/ধনী মানুষ Elite/rich people in the area		
46		4	ধর্মীয় নেতৃবৃন্দ Religious leaders		
47		5	সরকারী কর্তৃপক্ষ Government authorities		
48		6	উদ্ধারকারী দল/ স্বচ্ছসেবক দল Savings groups / self-help groups		
49		7	এন.জি.ও সমূহ NGOs		
50		8	কারো কাছ থেকে নয় Nobody		
51		99	জানি না Don't know		
52		97	অন্যান্য Other (specify)		
58	অন্যান্য (উল্লেখ করুন)Others (Specify)				

Supplementary File 3. In-depth interview guide and focus group discussion guide for community members with disaster experience

Topics to address in this IDI guide:

- Investigate the impact of aquatic disasters (natural and human) on the community
- Explore current disaster preparedness practices/resilience
- Understand role and measure in disaster relief management associated with drowning
- Explore health seeking behaviours of disaster related drowning events

(Questions only for volunteer leaders are underlined)

Demographic questions		
1.	Gender of participant:	Male Female
2.	Age of participant (in years):	
3.	Occupation of participant:	
4.	Role in the community:	
5.	<u>Are you associated with any organisation? (if volunteering from an organisation)</u>	

Themes	Queries	Probe/ clarifications/remarks
Introduction		
Background information	Explore participant background information	-Can you please tell me your name and for how long you have you lived in this community? -What is your position in the community? How long have you been in this position? -What are your main responsibilities within the community before/during/after a disaster?
Investigate the impact of aquatic disasters (natural and human) on the community		
	Explore general perceptions of disasters	-What do you know about disasters such as floods, cyclones etc? What do you think causes them? Have you ever received any education or training about natural disasters? If yes , from where/whom? What did you learn about? Was it useful? -Do you classify disasters as emergency situations? Why/why not? -Can the damage caused by a disaster be prevented/lessened? If yes or no , then why?
Explore current disaster preparedness practices/resilience		
	Explore safety perception regarding disasters	-What are some major safety issues that arise during a disaster? Please explain. -Do you think children/women/disabled people are safe during disasters? If yes or no , then why? What are the specific safety issues for these groups? How can their safety be improved during a disaster? -Do you know of any people who have drowned due to a disaster? If yes, please provide details. Do you think this could have been avoided? If yes , then how?
	Existing practices to protect against disaster	-What are some ways used for protecting people and households from flooding and other disasters? How did you and/or the community find out about this?

1		-Do many community members use these methods? Do you use these methods? If yes or no , then why? Do you think they are adequate to keep your household and family safe?
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6		<u>-Do you assist community members in implementing disaster preparedness systems? If yes, do you receive any support from government for this?</u>
7		
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9		
10	Existing practices during a disaster	-Does your community have a disaster management committee? If yes , who is part of it?
11		
12		-Does your community have any kind of plan to deal with disasters? If yes , please describe. If no , why? Do you know if a risk assessment has ever been performed for the area?
13		
14		-Has the community ever practiced responding to a disaster? Did you participate in this drill?
15		
16		- Who do you think plays an important role in responding to disasters in your area?
17		
18		-What systems are in place to warn community members when a disaster is approaching? If yes , who is responsible for running this?
19		
20		<u>-Do you have a role in warning the community? If yes, how do you know when to begin? Who leads the operation? How many other people work alongside you? What instructions do you provide community members with? Do you receive any support from government?</u>
21		
22		-What do community people generally do during a disaster? How do they try to stay safe?
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24		-Do community people use local cyclone centres? If no , then why?
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38	Existing practices following a disaster	-What happens after the disaster? How does community come back to their day to day activities?
39		
40		<u>-Do you have a role in post-disaster clean-up? If yes, what does this involve? Who coordinates clean-up efforts? Do you receive any support from government?</u>
41		
42		
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45		-What is done if parts of the community are no longer safe to be in/around (unstable infrastructure, flooded areas etc)?
46		
47		<u>- What do you think your area needs to help it better prepare and respond to disasters?</u>
48		
49		
50		
51	Understand role and measure in disaster relief management associated with drowning	
52	To identify key responsibilities and involvement with disaster and drowning	-Have you personally assisted with any drowning cases? If yes , please provide detail. How could you have been better supported to handle these people?
53		
54		
55		
56	Explore health seeking behaviours of disaster related drowning events	
57	Health seeking behaviours post-drowning due to disaster	-What health facilities are available during/directly following a disaster? Are these different from regular health facilities? Are they appropriate/adequate for the community's needs?
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59		-What health facilities do you think are needed to treat community members following a disaster? What are
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		some important features these services should have? Do you have any thoughts or preferences about who could provide these? [<i>Probe: government, NGO, other organisation</i>]
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Exit Questions

During our conversation, you mentioned W, X, Y, Z measures that could be taken to improve disaster preparedness for the community (and or post disaster measures) during or directly following a disaster. If you were to rank these from 1 to 5 (1 being most helpful and 5 least helpful in your community), what would the order be? And why? [*probe with high risk group- community need, feasibility, acceptability, sustainability*]

For peer review only

1 Topics to address in this FGD guide:

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- Investigate the impact of aquatic disasters (natural and human) on the community
 - Explore current disaster preparedness practices/resilience
 - Explore health seeking behaviours of disaster related drowning events
 - Understand role and measure in disaster relief management associated with drowning
- 7

8

9 **Introduction**

10 **Introductory statement**

11 Welcome, and thank you for agreeing to be part of today's focus group discussion. We appreciate your willingness
12 to participate and the time you have taken out of your day to take part.

13

14 My name is.....and I am from the Centre for Injury Prevention and Research, Bangladesh in Dhaka. We
15 are conducting these discussions with members of the Barisal community who have experienced natural or human
16 disaster. Our aim is to understand your views and experiences in relation to disaster-related drowning so that we
17 can find out the best way to reduce it in Bangladesh and in your communities. We would like to find out from you
18 what your thoughts/opinions and concerns are about drowning and how we can work together with you to reduce
19 drowning related deaths and disabilities in your communities.

20

21 First I would like to cover some general rules about how this discussion will run:

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1. We would like you all to do the talking and to hear from everyone in the group.
 2. Only one person should speak at a time so please wait for the person talking to finish.
 3. There are no right or wrong answers – every person's opinion and view is important and we would like to hear a range of different views.
 4. Anything discussed in this room remains in this room. We want everyone to feel comfortable about discussing any sensitive issue.
 5. We will be recording these discussions because we want to capture everything you have to say accurately. But please be assured that we do not identify anyone by name in any report and your identity will remain anonymous.
 6. Does anyone have any questions?

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33 **Explore participant background**
34 **information**

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Now I would like everyone to introduce themselves. Can you please tell us your name, age, occupation if any, and for how long you have been in this community for?

Theme	Discussion point	Probes/clarifications
Investigate the impact of aquatic disasters (natural and human) on the community		
Awareness/ Perception - <u>general</u>	<ul style="list-style-type: none"> ▪ What are some major safety issues that arise during a disaster? ▪ What about drowning? Who do you think is most at risk of drowning during a disaster? 	<ul style="list-style-type: none"> - When have you previously felt unsafe during a disaster? - Are children/women/disabled people more prone to drowning during disasters?
Explore current disaster preparedness practices/resilience		
Risk behaviours	<ul style="list-style-type: none"> ▪ What are some of the reasons community members drown during a disaster? 	<ul style="list-style-type: none"> - What types of disaster cause an increased risk of drowning? - Are there appropriate facilities and services available to prevent drowning/assist people who are drowning?
Current practices	<ul style="list-style-type: none"> ▪ How do you ensure that you and your family are prepared for a disaster? 	<ul style="list-style-type: none"> - What types of preparations do you make to your household prior to disaster? Where did you learn about these? - How do you receive warning when a disaster is approaching?

		- Do you and your household have an evacuation plan? What is it?
Barriers	- What are the barriers to ensuring you are prepared for disaster?	- What are the main barriers to making appropriate safety preparations before a disaster occurs? How could these barriers be minimised?
Explore health seeking behaviours of disaster related drowning events		
Experience of drowning events	<ul style="list-style-type: none"> ▪ Do you know of any people who have drowned due to a disaster? If yes, please describe the event. Please describe the situation. What happened? How and when did this happen? 	<ul style="list-style-type: none"> - Do you know if anyone attempted to help them? If yes, who and how? - How do you think this could have been prevented?
During drowning event	- How are people usually rescued in drowning situations during a disaster?	- Who are the people involved in the rescue and what are the associated risks for them?
Post drowning event	- Do you know what the usual immediate practices are after a person is recovered from water?	<ul style="list-style-type: none"> - Would you personally be confident in administering these? - What health facilities are available to treat drowning during/directly following a disaster? Are these adequate/appropriate?
Understand role and measure in disaster relief management associated with drowning		
	- What can be done to reduce the impact of a natural disaster in your community?	<ul style="list-style-type: none"> - What sort of programs, resources or facilities would be required for this? - Who do you think are best placed for implementing and overseeing this?
	- What is currently available to the community to prepare them for disaster?	- Have you ever received any kind of information about natural disasters? If yes, from where/whom? What did you learn? Was it useful?
Exit question		
<p>During our conversation, W, X, Y, Z measures were mentioned that could be taken to reduce drowning amongst fishermen. If you were to rank these from 1 to 5 (1 being most helpful and 5 least helpful for your community), what would the order be?</p> <p>Does anyone have any other questions or anything you would like to say or discuss further in this group?</p>		

Supplementary File 4. Key subthemes from qualitative analysis with illustrative quotes

Theme	Key sub-themes		Illustrative quotes
Perceptions of risk and consequences of disaster	1. Perceived causes of disaster	1a. Beliefs	<i>"And why these happen, I cannot say. Allah wishes - that's why it happens brother. Everything happens when Allah wishes." (P2, M, fisherman and shop owner)</i>
		1b. Climate change	<i>"Car, launch, steamer; all these release smoke which is harmful for nature and for that reason disaster takes place."(FGD2, M, small business owners))</i>
	2. Outcomes of disaster	2a. Loss of human life	<i>"We saw many dead bodies of people beside the road." (FGD1, M, business men and fishermen)</i>
		2b. Loss of livestock, agricultural land and produce	<i>"What is more problem is, the fishes of the pond go away. Because of this, the people suffer from financial problems. They lose everything." (P6, F, social worker)</i>
			<i>"The storm destroyed all the crops. I don't know whether we will get any rice or not from the grain." (FGD3, F, housewives)</i>
		2c. Damaged households	<i>"Now look at that broken house which is left there. That house was made newly, it was built only two to three months ago. Suddenly it was hit by the storm." (P7, F, housewife and NGO employee)</i>
		2d. Theft	<i>"We stay at home because if we leave the house the things will be stolen. We have nothing else than these things of the house. That's why we try to stay at the houses long as we can." (P3, M, agricultural worker)</i>
		2e. Damaged public infrastructure	<i>"Children cannot go to school and people have to swim to cross the roads. [The market] and cooking became a great problem." (FGD4, F, housewives)</i>
2f. Illness	<i>"When water comes during calamity, if people drink that water, people suffer from many diseases." (P6, F, social worker)</i>		
Insufficient support for the most vulnerable	3. Increased vulnerability to disaster	3a. Gender issues	<i>"During this time [women] are considered as a burden by other members of the family. They cannot move quickly, cannot come quickly." (P6, F, social worker)</i> <i>"Women are in risk because they wear many clothes and they have long hair. That hair might be untied and get stuck or twisted with anything else. They</i>

			<i>don't have that much strength. So they cannot free themselves." (FGD2, M, businessmen and fishermen)</i>
		3b. Dependence on others	<i>"Children can't move alone and don't know how to swim. Someone is needed to guard them. Sometimes kids get lost when they are moving with their parents as we can hold something to stay safe, but the kids can't." (P3, M, agricultural worker)</i>
		3c. Close proximity to water	<i>"All of us who were staying near the river bank, lost everything. Everything was broken down." (P4, M, fisherman and labourer)</i>
Community preparedness and practices	4. Preparing for disaster	4a. Preparation of food and resources	<i>"And we arrange everything properly and tie up with the beam, so that later on we can get everything in proper order." (FGD2, M, businessmen and fishermen)</i>
		4b. Modifications made to households	<i>"We put poles to support the house so that it doesn't fall. We take a thick rope and tie up one end of that rope with the house and tie up the other end of rope with a big tree tightly, so that the house doesn't fall during cyclone." (FGD3, F, housewives)</i>
		4c. Self-made safety equipment	<i>"We make some floating materials with plastic bottle of soft drink, or plastic water bottle etc. I made those floating materials for all the members of my family." (P6, F, social worker)</i>
		4d. Education provided by government and NGOs	<i>"Now everyone has got training. Everyone knows what is to be done, if there is cyclone. The people of coastal area have now become more conscious." (P6, F, social worker)</i>
	5. Protection at time of disaster	5a. Heterogeneity in mode of communication	<i>"We receive information through radio and television. We even get to know what type of disaster is coming. We received signals during Aila. Mic was used in our area to aware people." (P1, M, assistant teachers)</i>
		5b. Lack of compliance to warning systems	<i>"And another thing is people don't want to go. As long as possible they try to stay in their own place. If they have left their things in that place then they might have lost their things. People don't want to leave their resort in their entire life. That's why problem increases more and people get hurt more by drowning in water." (FGD1, M, small business owners)</i>
		5c. Reliance on cyclone shelters for protection	<i>"If we get information about flood, then we will have to move to [the cyclone shelter]. Apart from this we don't have any alternative." (FGD3, F, housewives)</i>

		5d. Cyclone shelters not meeting community needs	<p><i>“Cyclone centres are located far from this place. If these are located near to us then it would be possible to go to cyclone centre.” (FGD2, M, business men and fishermen)</i></p> <p><i>“Suppose there are two cyclone centres in our area. Already cracks have been developed in one building. Moreover they become filled up with people at the time when signal is shown.” (FGD2, M, business men and fishermen)</i></p>
		5e. Use of other resilient infrastructure for shelter	<p><i>“We took shelter in those people’s houses which were better means [than our house]. We took shelter in those houses which had strong foundation.” (FGD1, M, small business owners)</i></p>
		5f. Use of Indigenous floatation methods	<p><i>“We use banana tree to keep ourselves floating. When there is a flood, we cut down banana trees. This is the local method. By using these accessories, we can reduce drowning.” (P1, M, assistant teacher)</i></p>
Barriers to disaster response and improving resilience	6. Survival skills, rescue and resuscitation	6a. Lack of survival skills	<p><i>“A man in the north was totally puzzled and could decide which way to go with his old father. Then he was thinking whether he will save himself or will take his father. Then he tied up his father with a tree so that even if he dies at least his dead body will be found. Later on his father died tied up with that tree. Later, he was buried in the morning.” (FGD1, M, small business owners)</i></p> <p><i>“My grandson was seven months old. We put quilt, pillow in a big metallic utensil and then put him there and then said, ‘We are old. We cannot go to the marshy land, we cannot take him. Let him float on water. If Allah grants him life line then somehow he will survive and if he has no life line, then he will not be in this world anymore.” (FGD3, F, housewives)</i></p>
		6b. Rescue is a high-risk practice	<p><i>“While saving anyone from drowning he may also die. They have also several risks, like trees or boughs may break and fall on them.” (FGD4, F, housewives)</i></p>
		6c. Resuscitation using traditional methods	<p><i>‘[A] clay pot is grinded like powder and that powder is rubbed on the body. Then body has to cover with cotton so that water can release from his body. And if his body is moved taking his body on head, then he will remain alive.” (FGD3, F, housewives)</i></p>

		6d. Minimal access to health facilities post-event	<i>"If someone gets injured by accident then we have hospital here but don't have doctor. If someone gets seriously injured by accident in that case we have nothing to do." (FGD2, M, business men and fishermen)</i>
	7. Disaster relief	7a. Multiple parties are involved in relief	<i>"Then there were help from many places. Not only the government, but also many states of the world helped then. We helped people [too]; providing various relief: medicines, foods. We volunteered in these tasks." (P2, M, fisherman and shop owner)</i>
		7b. Bribery and nepotism control relief distribution	<i>"At that time [those] who could give money as bribe he got that house and money. But [those] who actually needed he did not get the house and money." (FGD1, M, small business owners)</i>
	8. Improving disaster resilience	8a. Improve community awareness	<i>"Here I would like to emphasize that if the people are given more training on calamity, then I think the risk might be reduced to some extent. Training has to be imparted to all." (P6, F, social worker)</i>
		8b. Provision of floatation devices and signals	<i>"People like us can try to survive if given a ring buoy or life jacket. By the grace of Allah we might be able to live." (FGD2, M, business men and fishermen)</i>
		8c. Generate political will	<i>"We don't have any idea who will do it for us. There is no benefit in asking to the members or the chairman. During the election they promise us a lot of things which ultimately they don't fulfil." (FGD4, F, housewives)</i>
		8d. Construct more cyclone centres	<i>"Cyclone centre are not constructed where they are supposed to be constructed. These are constructed in the area where people have power and influence. It would have been very helpful to the people if these centres could be built after every one and one and half kilometres." (FGD1, M, small business owners)</i>
		8e. Improve housing standards	<i>"If good strong houses can be made, then they can stay much safer. See everyone don't have the ability to build strong a house. For them, suppose, if a strong firm house can be made after every 4th or 5th house, then they can take shelter there. Storm will not bother much then." (P2, M, fisherman and shop owner)</i>
		8f. Construct more embankment s, barriers and dams	<i>"If block made of cement or concrete can be thrown beside the river bank then the people who live beside the river will remain well. And flood water will not be able to come easily. The river is breaking down in</i>

1			<i>such a way this place will not last long.” (FGD1, M, small business owners)</i>
2			
3		8g. Provide	<i>“When there is a disaster or flood, then if a service</i>
4		post-disaster	<i>centre is established, it will be very good for us. The</i>
5		medical	<i>sick need not to be taken to remote areas. Their</i>
6		service in	<i>treatment can be managed from here.” (P2, M,</i>
7		community	<i>fisherman and shop owner)</i>
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10		8h. Use	<i>“If anything is announced from mosque, people give</i>
11		mosques for	<i>more importance to it and obey it. Again if Imam</i>
12		warning	<i>discusses these things, then people will be able to</i>
13		signals and	<i>know more.” (FGD1, M, small business owners)</i>
14		shelter	
15			
16		8i. Increase	<i>“You can plant many trees on the coastal area. That</i>
17		tree	<i>will save us from the stormy wind. But people don’t</i>
18		plantations	<i>plant trees because many of them have no place, no</i>
19			<i>land or no money.” (FGD2, M, business men and</i>
20			<i>fishermen)</i>
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BMJ Open

Exploring the impact, response and preparedness to water-related natural disasters in the Barisal division of Bangladesh: A mixed methods study

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Manuscripts

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5 **Exploring the impact, response and preparedness to water-related natural disasters in the**
6 **Barisal division of Bangladesh: A mixed methods study**
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48 **Keywords:** Natural disaster, disaster preparedness, low- and middle-income countries,
49 drowning, flooding
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ABSTRACT

Objectives:

To investigate the impact of natural disasters on communities in the Barisal division of Bangladesh, exploring community approaches to disaster preparedness and mitigation.

Setting:

Communities in all districts of the Barisal division of Bangladesh.

Participants:

Quantitative data was collected through a cross-sectional household survey (n=9,263 households; n=38,981 individuals). Qualitative data was collected through in-depth interviews (n=7) and focus group discussions (n=23) with key informants.

Outcome measures:

Quantitative research recorded features of natural disaster events from the previous five years, documenting risk factors that increase vulnerability to disaster, use of disaster warning systems and evacuation processes. Qualitative research investigated disaster risk perceptions, experiences during and following disaster, and disaster preparedness practices.

Results:

The survey response rate was 94.7%. Exposure to disaster in the last five years was high (82%) with flooding and cyclones considered the greatest threats. Awareness of evacuation processes was low; and only 19% of respondents evacuated their homes at the time of disaster. Drowning during disaster was the primary concern (87%), followed by debt, livestock and crop loss (78%). The qualitative findings indicated prevailing fatalistic perceptions towards natural disasters among community. The consequences of disasters included significant loss of livelihoods and exposure to infections due to poor sanitation. There was also insufficient support for the most vulnerable, particularly women, children and the elderly. Although several community preparedness and practices existed, there was a lack of response to early warning systems.

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3 Barriers to disaster response and resilience included financial insecurities, loss of livelihoods,
4 and cultural concerns regarding women's privacy.
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7 **Conclusions:**
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10 Critical to achieving disaster resilience is increased government investment in infrastructure
11 and systems-level responses that empower communities. Further research can support this by
12 addressing community challenges to promoting disaster resilience and how to leverage existing
13 community strengths to implement locally-owned solutions.
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17 **Trial registration:**
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23 **Strengths and Limitations**
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- 25 • To our knowledge, this is the first large scale study reporting on context of disasters,
26 using mixed methods from a LMIC.
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- 28 • This study was conducted in a LMIC prone to water-related disasters and the results
29 may not be generalizable to other LMIC settings; however, the qualitative focus group
30 discussions and in-depth interviews spanned a diverse array of participants and yielded
31 rich data that greatly contextualized the cross-sectional survey
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- 34 • Consultations with government representatives are likely to have provided additional
35 insight into existing government initiatives targeted at disaster preparedness and
36 response
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INTRODUCTION

Climate-related disasters significantly impact the health, personal security and livelihood of individuals, communities and societies. Between 1998 and 2017, climate-related disasters were the cause of over 1.3 million deaths worldwide, and resulted in a further 4.4 billion people sustaining injuries, becoming homeless, displaced or requiring emergency assistance¹. The impacts of climate related disaster are most severely experienced by those living in low- and middle-income countries (LMICs) who have a higher dependence on natural resources and who are exposed to higher rates of socio-economic disadvantage which prevents the development of coping capacity². One such country is Bangladesh, which is highly prone to flooding due to the annual monsoon rainfalls and extensive low lying floodplains that cover an estimated 80% of the densely populated country³. With a population of over 165 million, it is estimated that more than two thirds of people in Bangladesh live in regions at risk of floods and one quarter live in regions at risk of cyclone⁴. The consequences of flooding in this context include the threat of diarrhoeal disease, lack of access to safe drinking water, loss of housing, livestock, crops, livelihood activities and drowning in floodwaters^{3,4}. Additionally, tropical cyclones are an annual occurrence, which directly contribute to flooding and in turn, drowning-related mortality and morbidity⁴.

There is an increasing global focus on strengthening disaster risk reduction through improved surveillance, information exchange, early warning systems and capacity building in disaster prone countries. From 2005 to 2015, global governments committed to implementing the Hyogo Framework for Action as a guideline for reducing disaster risk through resilience building at both the national and local levels⁵. More recently, the Sendai Framework for Disaster Risk Reduction 2015-2030 was adopted by the United Nations member states in March 2015. The framework represents the next phase of targets and priorities globally, recognising the threat that climate change and disaster risk pose to achieving the Sustainable Development Goals (SDGs)⁶.

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3 The risk of natural disasters in Bangladesh is projected to increase with changing weather
4 patterns associated with extreme vulnerability to climate change³⁴⁷⁸. In the face of growing
5 climate uncertainty, there is an urgent need to understand disaster practices and promote
6 community disaster resilience. In 1991, Cyclone Gorky struck Bangladesh, claiming the lives of
7 138,000 people. This event has spurred improvements in disaster warning systems and
8 increased shelter uptake over the last 20 years⁴⁹ however, there remain considerable
9 challenges in fostering disaster resilience at all levels. Currently, there is only fragmented
10 information available on the consequences of natural disasters in Bangladesh and on existing
11 practices associated with disaster mitigation. Through identifying gaps in current processes,
12 targeted interventions may be implemented to strengthen existing approaches to disaster
13 preparedness, with a focus on disaster risk reduction. Therefore, this study aims to investigate
14 the impact of natural disasters on communities in the Barisal division of Bangladesh, exploring
15 community disaster preparedness, responses to disaster at time of onset, and health seeking
16 behaviours following disaster events. Given the complex nature of this topic, a mixed methods
17 approach was used to facilitate a comprehensive understanding of the impact of and practices
18 that surround natural disasters in the Bangladesh context. This information is anticipated to
19 contribute to future disaster resilience planning activities for the region.
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36 METHODS

37 Study setting

38 The Barisal division is located in south central Bangladesh and is comprised of six districts and
39 39 sub-districts (Figure 1). Crossed by numerous rivers, it is highly exposed to flooding due to
40 annual monsoon rains and low-lying flood plains.
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47 **Figure 1: Map of the Barisal division of Bangladesh (Source: Royal National Lifeboat**
48 **Institution, UK. Figure used with permission of the copyright holders)**
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50 Study design

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3 The study used a concurrent mixed methods approach, triangulating cross-sectional household
4 survey data with qualitative in-depth interviews and focus group discussions. Both quantitative
5 and qualitative data were collected as baseline measures of a larger intervention study which
6
7 aims to significantly reduce drowning rates in the Barisal Division by 2020. As no previous
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9 literature was available regarding Knowledge, Attitude and Practices for disaster resilience from
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11 LMICs, a mixed methods approach was used to gain an in-depth understanding of behaviors,
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13 perceptions and responses to disaster.
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16 17 18 **MATERIALS AND DATA COLLECTION**

19 **Quantitative**

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21 The survey was conducted September 2016 – February 2017 (over a six month period), using a
22
23 multi-stage cluster sampling method. The survey was conducted as a baseline measure for a
24
25 larger intervention-based drowning reduction project to be implemented in selected districts of
26
27 the Barisal division from 2017 to 2020. The sample size (n=385,000) was chosen based on the
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29 sample required for the previous Bangladesh Health and Injury Survey¹⁰, with the margins of 95%
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31 Confidence Intervals providing evidence of sufficient sample size.
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33 Briefly, the sample selected represents all districts within the division. Upazilas from the districts
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35 were randomly selected to be included in the project, with further random selection used to
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37 identify villages/sites within each upazila for data collection. Within each village, households
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39 were selecting using the EPI sampling method ¹¹. The disaster subsample (10%, n=38,981) was
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41 selected from the main sampling frame by selecting every household with computer generated
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43 ID ending in '0. Questions presented to participants within the disaster sub-sample were
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45 primarily focused on post-disaster practices at the time of disaster to assess the acceptability,
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47 reliability and coverage of existing warning systems. The survey questions are available as
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49 Supplementary File 1.
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52 Trained data collectors, local to each participating community, used pre-tested structured
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54 questionnaires to collect information from household heads, mothers or any adult above 18
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56 years through face-to-face interviews. One adult was interviewed per household, who reported
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3 data on behalf of all household members. An electronic data capture system (REDCap) was
4 used on tablets for data collection¹². To ensure data quality and accuracy, trained supervisors
5 observed and checked 10% collected data and re-interviewed 2% of households. The survey
6 consisted of questions on knowledge, attitudes and perceptions/practices for community
7 drowning and disaster risk, and about experiences of natural disaster in the previous five years.
8 Data were collected on demographic characteristics, and on socio-economic status using an
9 index developed for the 2014 Bangladesh Demographic and Health Survey.¹³
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18 **Qualitative**

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20 Purposive sampling was used to identify key informants from the community for in-depth
21 interviews and focus group discussions. For inclusion in the study, participants were required to
22 have resided within Barisal for at least six months prior to data collection. Separate male and
23 female discussion groups were arranged to align with cultural practices. The interviews and
24 female discussion groups were arranged to align with cultural practices. The interviews and
25 focus group discussions were semi-structured and conducted by trained research assistants in
26 community locations that were acceptable and accessible to participants. Consent was
27 obtained prior to commencing data collection; interviews lasted between 40-60 minutes, whilst
28 focus group discussions lasted between 1-1.5 hours. The interview and focus group discussion
29 guides included questions related to: 1) disaster risk perceptions; 2) experiences of natural
30 disaster; 3) disaster preparedness practices. Questions aimed to identify examples of good
31 practice in disaster preparedness from community settings to include in future comprehensive
32 disaster resilience planning activities. Further, questions aimed to explore gaps in current
33 disaster preparation, management and relief processes that have potential be addressed
34 through targeted interventions. Interview and focus group discussion guides are available as
35 Supplementary File 2.
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49 Interviews and focus group discussions were conducted in Bengali, audio-recorded, translated
50 and transcribed in English. To minimise data loss, interviews were jointly translated and
51 transcribed by the interviewing researcher and the translator, and a member of the research
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3 team checked the translated transcripts for accuracy. Interviews ceased when saturation of
4 meaning was considered to have occurred.
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8 **ANALYSIS**

9 **Quantitative**

10 Descriptive analysis (counts and percentages) was performed on variables relating to disaster
11 knowledge, attitudes and behaviour variables. All data were analysed using SAS 9.4 with
12 SAS/STAT 14.2 (SAS Institute, Cary, NC, USA).
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18 **Qualitative**

19 Transcripts were imported into NVivo qualitative data analysis software (QSR International Pty
20 Ltd. V.11, 2015). Content analysis was applied to the transcripts whereby overarching themes
21 were initially developed followed by inductive thematic coding of the data. NVivo was used to
22 arrange the text according to codes and manage the codes in the interpretive phase. Two
23 researchers independently conducted the coding and arrived at consensus on the analyses.
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32 **Patient and Public Involvement**

33 Drowning was identified as a priority health issue through the 2014 Bangladesh Demographic
34 and Health Survey, which collected data from 18,000 residential households nation-wide.¹³
35 Data collection instruments for this present study were developed by the project team in
36 alignment with Bangladesh Health and Injury Survey findings¹⁰, designed to investigate notable
37 drowning-related outcomes in greater depth. All data collection tools were trialled with end
38 users prior to their use in this study, investigating their readability, clarity and the relevance of
39 questions included. Study results were triangulated among key informants and consultations
40 and were used to inform the development of pilot interventions for improving water safety and
41 reducing drowning in community settings in Bangladesh.
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52 **RESULTS**

53 **Quantitative results**

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A total of 95,124 households were visited, of which 92,616 household representatives were available for completing the survey (this corresponded to data gathered for n= 385,127 individuals; response rate 94.7%). There was an average household size of 4.2 members. For the disaster toll sub- sample of (n=9,263 households visited, data collected for n= 38,981 individuals) was completed. There were no meaningful differences in the socio-demographic characteristics of the full household survey sample and the disaster subsample (Table 1). All following results reported are for the survey disaster sub-sample. These findings are reported in line with the Consolidated Criteria for Reporting Qualitative Research statement, which supports transparency in reporting qualitative research (Supplementary File 3).

Table 1. Socio-demographics of the full household survey and disaster survey subsample

		Disaster subsample n=38,981 (95%CI)	Full household sample n=385,127, (95%CI)
Age (years)	Infant	2.0% (1.8 - 2.2)	2.0% (1.9 - 2.0)
	1-4	8.1% (7.8 - 8.5)	8.2% (8.0 - 8.3)
	5-9	11.0% (10.7 - 11.4)	10.7% (10.5 - 10.8)
	10-14	10.8% (10.5 - 11.1)	10.7% (10.6 - 10.9)
	15-17	5.9% (5.6 - 6.2)	6.0% (5.9 - 6.1)
	18-24	13.6% (13.1 - 14.1)	14.0% (13.8 - 14.2)
	25-39	24.6% (24.0 - 25.2)	24.1% (23.7 - 24.4)
	40-59	17.1% (16.6 - 17.5)	17.5% (17.3 - 17.7)
	60 +	6.8% (6.4 - 7.1)	6.9% (6.7 - 7.1)
Sex	Male	49.1% (48.5 - 49.8)	49.2% (48.8 - 49.5)
	Female	50.9% (50.2 - 51.5)	50.8% (50.5 - 51.2)
Marital status	Married	50.4% (49.9 - 50.9)	50.6% (50.3 - 51.0)
	Never Married	45.7% (45.2 - 46.2)	45.3% (45.1 - 45.6)
	Divorced	0.3% (0.2 - 0.4)	0.3% (0.3 - 0.4)
	Widow/Widower	3.4% (3.2 - 3.7)	3.5% (3.4 - 3.7)
	Separated	0.2% (0.1 - 0.2)	0.2% (0.2 - 0.2)
Type of family	Nuclear Family	67.5% (65.4 - 69.7)	66.6% (64.8 - 68.3)
	Extended Family	32.5% (30.3 - 34.6)	33.4% (31.7 - 35.2)
Family size	5 or less persons	78.6% (77.0 - 80.3)	78.6% (77.4 - 79.8)
	More than 5 persons	21.4% (19.7 - 23.0)	21.4% (20.2 - 22.6)
Education completed	Not applicable	16.3% (15.4 - 17.3)	16.2% (15.2 - 17.1)
	1 to 5 years	39.9% (38.9 - 40.9)	39.8% (39.0 - 40.7)
	6 to 8 years	17.9% (17.3 - 18.5)	17.6% (17.2 - 18.1)
	9 to 12 years	16.4% (15.6 - 17.3)	16.6% (16.0 - 17.2)

	13 to 17 years	3.7% (3.3 - 4.0)	3.7% (3.4 - 3.9)
	None	5.7% (4.8 - 6.7)	6.1% (5.2 - 7.0)
Maternal education	1 to 5 years	47.9% (46.4 - 49.5)	46.3% (45.1 - 47.5)
	6 to 8 years	20.6% (19.3 - 21.8)	20.5% (19.5 - 21.4)
	9 to 12 years	13.2% (12.1 - 14.4)	14.2% (13.5 - 15.0)
	13 to 17 years	1.5% (1.2 - 1.8)	1.4% (1.3 - 1.6)
	None	16.7% (15.3 - 18.2)	17.6% (16.4 - 18.8)
Monthly income (USD/month)	<80	9.0% (7.9 - 10.2)	9.2% (8.2 - 10.2)
	80-99	16.2% (14.8 - 17.6)	16.8% (15.8 - 17.7)
	100-139	25.8% (24.0 - 27.6)	25.9% (24.5 - 27.2)
	140-179	17.8% (16.4 - 19.2)	17.5% (16.6 - 18.4)
	800+	31.2% (28.6 - 33.7)	30.7% (28.6 - 32.7)
Primary occupation	Agriculture	6.4% (5.8 - 6.9)	6.3% (5.8 - 6.8)
	Business	5.9% (5.5 - 6.2)	5.8% (5.6 - 6.0)
	Student	27.9% (27.4 - 28.5)	27.5% (27.2 - 27.9)
	Domestic work	28.5% (28.1 - 28.8)	28.6% (28.4 - 28.9)
	Service	3.7% (3.4 - 4.1)	3.9% (3.7 - 4.2)
	Not working	3.2% (2.9 - 3.5)	3.3% (3.1 - 3.5)
	Skilled	3.8% (3.5 - 4.0)	3.7% (3.5 - 3.9)
	Unskilled	6.8% (6.3 - 7.3)	7.0% (6.5 - 7.4)
	Other	13.8% (13.4 - 14.3)	13.8% (13.6 - 14.1)

Types of disaster

Using a recall period of five years, the most common natural disaster events experienced by respondents were flooding/flash flooding (43%) and cyclones (35%). The majority of respondents (82%) reported experiencing one or more natural disasters in the previous five years. Of these respondents, two thirds believed flooding/flash flooding to be the greatest threat, followed by cyclones/big storms.

Vulnerability and impact

Respondents were asked which members of the population were most likely to be impacted by natural disasters. Age was considered to be an important factor with older people (23%) and children (19%) considered to be most susceptible. Poor socioeconomic status (21%) was perceived to increase vulnerability to natural disasters. Occupations perceived to be most affected by the natural disaster were farming (32%), labourer jobs (31%) and fishing (20%).

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3 Drowning during disaster was the primary concern for 87% of respondents. Debt, livestock and
4 crop loss were prevailing concerns among the majority of respondents (78%), while just 10% of
5 respondents considered health to be a priority issue during disaster
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10 **Risk and protective factors**

11 The survey asked two separate questions with respect to weather forecast and warning signals.
12 Only 18% of the respondents reported having received any type of weather forecast
13 information prior to the most recent natural disaster that they had experienced. The most
14 frequent sources of weather forecast information mentioned were from television (30%), alarm
15 or loud speakers (20%), and through friends, families or neighbours (18%).
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23 A high proportion of respondents (70%) reported having received warning signals prior to the
24 onset of natural disaster. Although almost all households (95%) had at least one member who
25 owned a mobile phone, the most common source of warning signal was television (45%)
26 followed by warnings from local authorities (21%) and volunteers (21%).
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32 The majority of respondents (95%) reported their household roof to be made of tin and only 4%
33 reported to have a concrete roof. Walls were made of tin for 85% of households and brick and
34 plaster for 11% of the households.
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40 **Disaster preparedness practices**

41 Among respondents who reported to have experienced a natural disaster, only 19% evacuated
42 at the time of the event. Limited money followed by limited time were identified as the two
43 most common barriers to disaster preparedness (data not shown). Of the 81% of respondents
44 who reported not evacuating, 44% believed evacuation was not required, 38% believed an
45 alternative shelter was not easily accessible, 25% did not evacuate due to concerns about the
46 security of their property and 13% remained to protect livestock. Less than 5% of community
47 members were aware of evacuation processes or safe evacuation points/places.
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Among respondents who had experienced disaster, 22% reported moving to an alternate shelter during the most recent event. All reported moves were self-initiated with no rescues required from residences. Cyclone shelters (54%) were used most often used for evacuation followed by educational institutions (23%), flood shelters (13%), relative's homes (9%) and community centres (1%).

Qualitative results

Interviewee characteristics are presented in Table 2. Four focus groups were conducted consisting of two male groups and two female groups, with characteristics presented in Table 3.

Table 2 Characteristics of in-depth interview participants

	Gender	Age range (years)	Occupation	Disaster-related role
P1	M	35-39	Assistant teacher at high school	Opens the doors of the local cyclone centre and escorts people inside
P2	M	30-34	Fisherman and shop owner	Delivers disaster warning signal through mic in village
P3	M	30-34	Agricultural worker	Not specified
P4	M	35-39	Fisherman and labourer	Member of village disaster committee
P5	F	25-29	Assistant teacher at primary school	Opens the doors of the school building and escorts people inside for shelter
P6	F	35-39	Social worker	Educates villagers on disaster preparedness, assists in delivering warning signal, helps vulnerable people evacuate households, leads search parties
P7	F	25-29	Housewife and employee of family	Vice president of village disaster committee (administrative role)

planning NGO

Table 3 Characteristics of focus group discussion participants

	Gender	Age range (years)	N in each group	Occupation
FGD1	M	30-60	6	Small business owners, fishermen, shop keepers
FGD2	M	Unknown	6	Business men and fishermen
FGD3	F	25-50	6	Housewives
FGD4	F	25-50	5	Housewives

Four overarching themes emerged from the qualitative data: 1) Perceptions and consequences of disaster; 2) Insufficient support for the most vulnerable (economically, geographically and personal physical attributes); 3) Community preparedness and practices; 4) Barriers to disaster response and improving resilience. The four overarching themes were drawn together from key sub themes which are available in Supplementary File 4, together with illustrative quotes.

Perceptions of risk and consequences of disaster

Community members perceived disasters to not be preventable and viewed disaster-related death as unavoidable, or to occur as a result of “Allah’s will”. There was some acknowledgment of the relationship between water-related disasters and climate uncertainty, which was attributed to the impact of pollution.

“And why these happen, I cannot say. Allah wishes - that’s why it happens brother. Everything happens when Allah wishes.” (P2, M, fisherman and shop owner)

A major concern for community members was the consequences of disaster on agriculture, with erosion and loss of crops and livestock having devastating impacts on livelihood.

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3 *“The storm destroyed all the crops. I don’t know whether we will get any rice or not from the*
4 *grain.”* (FGD3, F, housewives)
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9 In particular, loss of livestock was a significant concern for farmers, and the need to protect
10 livestock presented a major impediment to evacuation. Similarly, theft and looting were cited
11 as both a consequence of disaster and an impediment to evacuation. In terms of health
12 consequences, drowning and illness due to poor sanitation post-disaster were considered to be
13 major contributors to disaster-related morbidity and mortality.
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18 19 20 **Insufficient support for the most vulnerable**

21 Respondents frequently reported on the structural weakness of existing dwellings and their
22 inability to withstand a disaster event. A number of personal characteristics were repeatedly
23 associated with increased vulnerability to drowning. Many of these surrounded the notion of
24 ‘weakness’ – an inability to move quickly, hold onto stationary objects when caught in flood
25 waters, swim against currents, climb to safe areas above flood waters, or carry belongings
26 overhead when crossing flood waters. Many of characteristics were specific to women, with
27 traditional clothing worn becoming heavy when wet, or long hair becoming caught on objects
28 preventing escape from flood waters.
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38 *“Women are in risk because they wear many clothes and they have long hair. That hair might be*
39 *untied and get stuck or twisted with anything else. They don’t have that much strength. So they*
40 *cannot free themselves.”* (FGD2, M, businessmen and fishermen)
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45 Statements were made about the care a woman feels for her children making her a liability to
46 the broader family. There were mentions that women were less able than men to maintain
47 calm or plan rationally in high pressure situations.
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52 53 **Community preparedness and practices**

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3 Participants discussed a number of approaches to preparing their households prior to disaster.
4 These included securing food and valuables in safe, waterproof storage places, reinforcing
5 households with rope and tarp, and creating floatation devices for family members from empty
6 plastic soft drink bottles in case of flooding.
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12 *“We put poles to support the house so that it doesn’t fall. We take a thick rope and tie up one*
13 *end of that rope with the house and tie up the other end of rope with a big tree tightly, so that*
14 *the house doesn’t fall during cyclone.”* (FGD3, F, housewives)
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19 A variety of sources were used to communicate warnings in community settings prior and
20 during disasters. Not all community members owned a TV or radio, and as power is often lost
21 during weather events, loudspeaker announcements in village settings were considered to be
22 most the effective warning signal. These announcements appeared to be predominantly
23 coordinated by NGOs. Warning signals were either based on a 10-point scale which indicates
24 event severity, or were a simple call for evacuation, directing community members towards
25 cyclone shelters and other protected areas of the community. Community members
26 interpreted warning signals in different ways, with individuals having different thresholds for
27 deciding when evacuation was necessary. Previous warnings given for seemingly minor events
28 caused many participants to be skeptical about the urgency of signals.
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40 *“And another thing is people don’t want to go. As long as possible they try to stay in their own*
41 *place. If they have left their things in that place then they might have lost their things. People*
42 *don’t want to leave their resort in their entire life. That’s why problem increases more and*
43 *people get hurt more by drowning in water.”* (FGD1, M, small business owners)
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49 Many drowning deaths were reported to be caused by people evacuating their households
50 after not responding to early warnings. Despite this, evacuation was considered an
51 inconvenience to community members due to difficulties with transporting less-mobile people
52 and the looting that frequently occurs when households are left unattended. One participant
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3 reported thieves staging false disaster warning signals for an opportunity to rob empty
4 households.
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7 *“We stay at home because if we leave the house the things will be stolen. We have nothing else*
8 *than these things of the house. That’s why we try to stay at the houses long as we can.”* (P3, M,
9 agricultural worker)
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12 13 14 **Barriers to disaster response and improving resilience**

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16 Although there were a number of approaches documented towards disaster preparedness,
17 management and relief, many of these were considered to be unreliable or unsustainable.
18 Many participants discussed disaster management education provided by NGOs in community
19 settings. Although useful, these education programs were reported to be sporadic and with
20 varied content. A lack of resources limited the extent individuals were able implement the
21 practices taught. Consequently, disaster preparedness was predominately managed by
22 individual community members.
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31 Government initiatives were primarily focused on protection at time of disaster and relief post-
32 disaster. A number of cyclone shelters had been built by government in community settings and
33 were frequently used by the most vulnerable members of the community at the time of
34 disaster. Despite this, cyclone shelters were reported to be difficult to access due to unsafe
35 roads and long distances between shelters. Furthermore, shelters were reportedly over-
36 crowded, with poor structural quality, and were potentially unsafe places for women.
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44 *“Suppose there are two cyclone centres in our area. Already cracks have been developed in one*
45 *building. Moreover they become filled up with people at the time when signal is shown.”* (FGD2,
46 M, business men and fishermen)
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51 There was a clear lack of faith in governance, with many comments concerning unequal
52 distribution of government relief post-disaster, driven by bribery and nepotism.
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3 *“At that time [those] who could give money as bribe he got that house and money. But [those]*
4 *who actually needed he did not get the house and money.”* (FGD1, M, small business owners)
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9 Government post-disaster relief was only available over short periods of time post-event and in
10 some cases, was also provided sporadically by NGOs.
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13 14 **DISCUSSION**

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16 This study has highlighted the considerable challenges confronting communities in disaster
17 prone regions of Bangladesh in the face of inadequate warning systems, poor understanding
18 and uptake of evacuation measures, and insufficient relief responses. Each of these challenges
19 are heightened for populations in remote geographical areas and those who are economically
20 deprived. The impacts of disaster presented a heavy burden to communities in terms of
21 housing, economic losses and the threat of drowning and illness. Identifying these issues
22 highlights areas of priority to address through interventions. Increasing commitment from
23 government to address disaster risk was viewed as a crucial step towards reducing disaster-
24 related devastation. As a result, further investigation into policy interventions to improve
25 governance surrounding this issue is required. Further, the need for community to self-manage
26 disaster risk was considered a priority. This study identified several community strengths that
27 could be built upon as part of a comprehensive disaster resilience plan that fosters this
28 approach.
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42 A major impediment identified to effective disaster preparedness was the efficacy of warning
43 systems. Despite high levels of mobile phone penetration in Bangladesh, the majority of survey
44 respondents did not receive warnings through this means and instead relied on television (45%)
45 and warnings from local authorities and volunteers (21%). There was significant heterogeneity
46 in understanding and heeding warning signals, which contributed to a reluctance for
47 evacuation. Warning signal efficacy was impacted by loss of electricity during flooding and poor
48 community confidence in warning systems. This is consistent with the Osti and Nakasu³ review
49 of inadequate warning systems across 10 southern and eastern Asian countries during 21 fatal
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3 flood events. The authors reported flood warning systems to be unreliable and the content of
4 warnings to be too technical for community members. Taken together, these findings have
5 critical implications for future research relating to appropriate messaging and the use of mobile
6 technology as an avenue for early warning with high coverage.
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12 There is significant unmet community need for effective disaster response, which must be
13 addressed to move towards ensuring disaster resilience rather than recovery. While
14 communities demonstrated strength with self-reliance, a systems level approach was required
15 to support the development of disaster resilience. There is limited insight into the ongoing
16 mental health effects of disaster and how this impacts community resilience in disaster prone
17 regions¹⁴. However, the present findings confirm previous research that indicates disaster has a
18 traumatic impact on families and communities. This signifies the need for a mental health
19 workforce that are competent in disaster-related trauma and are responsive to the community
20 in terms of culture, traditions, language and local practices¹⁵. Further research is critical to
21 understanding the impact of psychological trauma, which women may be more affected by
22 than men, on community disaster resilience
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34 At the community level, there was considerable concern for preserving agriculture and
35 ultimately livelihoods. Protecting livestock was cited as a major barrier to evacuation and a
36 significant contributor to disaster vulnerability, with 78% of survey participants reporting
37 prevailing concerns about debt, livestock and crop loss at the time of a disaster event.
38 Individual and community level factors were key contributors to vulnerability, in particular
39 house construction, age and gender.
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47 Women were perceived to be more vulnerable than men, which was consistent with previous
48 research^{9 16}; however in high income settings, men have a higher mortality attributed to flood
49 related-drowning¹⁷. This is indicative of the “socially determined” role of women in many
50 LMICs and is aligned with an emerging focus in disaster literature on the role of women and
51 how this contributes to vulnerability^{9 14 16}. In Bangladesh, this is related to the socioeconomic
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3 status of women, health status and perpetration of violence against women ¹⁶. A cross-
4 sectional survey with mothers spanning two floods in Bangladesh in 2007, reported 86% of
5 women experienced intimate partner violence (physical, emotional, sexual and sustenance
6 abuse) during a flood ¹⁸. This study also reported that both unintentional injury (cuts, falls,
7 drowning etc.) and parental violence against children is increased during flooding disaster ¹⁸.
8 Perpetration of parental violence (physical, emotional and sustenance abuse) against children
9 was highest in low socioeconomic families, in families with household unemployment and
10 among mothers; particularly mothers engaged in domestic work (not employed) and those
11 experiencing intimate-partner violence, all of which related to the extreme survival pressure.
12 While women are seen as vulnerable to disaster and disaster-related trauma, there is great
13 opportunity to empower and educate women in disaster preparedness and management
14 practices to promote community resilience. ¹⁴
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27 Natural disasters have a number of long-term indirect impacts on vulnerable populations.
28 Communities repeatedly exposed to disasters may experience forced migration, either to urban
29 centres or onto other hazard prone land.¹⁹ This contributes to rising land pressure, rapid
30 urbanisation and a breakdown of community and social structures which disproportionately
31 affects the poorest members of the population, increasing marginalisation.²⁰ A lack of stability
32 and security establishes a poverty cycle²¹ and enhances existing issues surrounding gender and
33 social inequality.²² The under- age marriage and trafficking of young girls has been reported to
34 increase following disaster as children lose their parents, parents are unable to afford
35 education due to disaster repair costs, or as schools are destroyed during disaster, impacting
36 social-determinants of health adversely.²³
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47 **Implication for practice**

48 **Improve commitment from government**

49 Given the population density and scarce resources in the context, greater investment in
50 preparedness and education rather than management and recovery is needed in Bangladesh.
51 Disaster management was primarily undertaken by the NGOs/ multi- laterals, which was
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3 reported to be inconsistent. There is a need for improved coordination between relevant
4 government agencies and NGOs to: 1) prevent overlap of interventions in certain areas and
5 support areas/communities currently without any interventions; 2) ensure the interventions
6 available are consistent and offered to a high standard; 3) ensure post-disaster aid is distributed
7 using regulated processes to areas of most need; and 4) ensure allocation of funding is fair and
8 appropriate governance mechanisms in place for distribution of support. Indeed Government
9 investment is essential to obtaining resources to improve basic public infrastructure (roads,
10 dams and river embankments), constructing protective infrastructure, such as cyclone shelters
11 and for improving the availability of emergency medical care post-disaster. In Bangladesh,
12 increased Government ownership and coordination could see considerable gains, however
13 better engagement with stakeholders at the community and policy level is needed to ensure a
14 community owned approach to promoting disaster resilience.
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Build resilient communities by enabling self-management of disaster risk

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28 All initiatives implemented should focus on empowering communities to mitigate disaster risk
29 locally. This will assist in the promotion of cost-effective, local approaches to disaster
30 preparedness, such as homemade personal floatation devices made from community sourced
31 and readily available materials. The findings report on how communities/society in rural
32 Bangladesh have organized themselves to increase resilience and manage disasters more
33 effectively.
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42 Participants reported not using cyclone shelters, however over-crowding of shelters was also
43 reported as a deterrent. Community ownership with respect to consultation on shelter location,
44 feasibility and usability of infrastructure to access shelters might address some of the mistrust
45 in governance/disaster management. This may be aided by building and using community
46 infrastructures such as schools or mosques as disaster shelters, which would be an efficient and
47 acceptable use of resources. Finally, whilst the community reported poor access to health
48 services generally, this was compounded during disasters when it was clear that the health
49 systems were non-existent; the need for resilient health systems cannot be over-stated.
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5 Resilience will also depend upon the capacity of disaster management practices to be adjusted
6 in a timely manner, in response to changing community priorities and the changing local
7 environment. There should be a focus on reducing internal community conflicts caused by the
8 provision of external resources to promote cohesive, united, community-based response to
9 disaster. This would be aided by formal disaster committees, which would be helpful not only
10 as an entity but for understanding and addressing concerns on distribution of resources within
11 the population; however, to be effective this also needs to be monitored. The aim of these
12 committees could be to prepare the local population for disaster and take leadership in
13 assisting community members at the time of disaster. To be effective, committee members
14 would need external training (provided by government and/or NGOs) at regular intervals on
15 various aspects of disaster preparedness, rescue and relief. Importantly, these committees
16 should consist of a diverse range of community members who are part of the committee at an
17 equal rank, including women and the elderly. Furthermore, committees should be Government
18 resourced and be in regular contact with government agencies and NGOs operating locally.
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32 **Strengths and limitations**

34 To our knowledge, this is the first large scale study reporting on the context of natural disasters,
35 using mixed methods, from a LMIC. The qualitative research performed spanned a diverse
36 range of participants and yielded rich data that greatly contextualized the cross-sectional
37 survey. As the study was conducted in a country prone to water-related disasters, the results
38 may not be generalizable to other LMIC settings. Secondly, the recall period was relatively large
39 with 5 years which may influence the reliability of the findings. Consultations with government
40 representatives are likely to have provided additional insight into existing government
41 initiatives targeted at disaster preparedness and response, highlighting strengths and gaps in
42 existing disaster mitigation policies.
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52 **CONCLUSION**

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3 This study has highlighted the challenges facing water-related disaster prone region of
4 Bangladesh. The results confirm previous research that emphasize the vulnerability of
5 communities in the face of inadequate warning systems and poorly coordinated disaster
6 responses, particularly for vulnerable/disadvantaged sectors of the community including the
7 elderly, women, low socioeconomic families and those whose livelihood is rooted in agriculture.
8 This research calls for increased government investment in systems level responses that
9 empower communities and promote resilience. Further research can support this by addressing
10 the systems level challenges to promoting disaster resilience, and investigating how existing
11 community strengths can be leveraged to implement locally-owned solutions.
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AUTHORS' CONTRIBUTION

JJ, AR, KB and RI conceived the study and its design. AR, FC and KB led the acquisition of study data. KB led the quantitative data analysis. PC, FC and CL performed initial qualitative data analysis. AR, RI, JJ and KB led data interpretation. All authors contributed to manuscript writing critically, for important intellectual content.

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COMPETING INTERESTS

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3 The authors have declared that no competing interests exist. Royal National Lifeboat Institution
4 funded the project with Centre for Injury Prevention and Research, Bangladesh as collaborators
5 and The George Institute for Global Health as academic partners.
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10 **DATA SHARING**

11 Requests for access to study data should be addressed to the corresponding author. Data will
12 be made available to the scientific community with as few restrictions as feasible, while
13 retaining exclusive use until the publication of major outputs.
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19 **ETHICAL APPROVAL**

20 Ethical clearance for this study was obtained from the University of Sydney, Australia; and
21 Ethical Review Committee – Centre for Injury Prevention and Research Bangladesh.
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Image 1: Map for study area- Barisal division, Bangladesh

30x22mm (300 x 300 DPI)

COREQ (COnsolidated criteria for REporting Qualitative research) Checklist

A checklist of items that should be included in reports of qualitative research. You must report the page number in your manuscript where you consider each of the items listed in this checklist. If you have not included this information, either revise your manuscript accordingly before submitting or note N/A.

Topic	Item No.	Guide Questions/Description	Reported on Page No.
Domain 1: Research team and reflexivity			
<i>Personal characteristics</i>			
Interviewer/facilitator	1	Which author/s conducted the interview or focus group?	
Credentials	2	What were the researcher's credentials? E.g. PhD, MD	
Occupation	3	What was their occupation at the time of the study?	
Gender	4	Was the researcher male or female?	
Experience and training	5	What experience or training did the researcher have?	
<i>Relationship with participants</i>			
Relationship established	6	Was a relationship established prior to study commencement?	
Participant knowledge of the interviewer	7	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	
Interviewer characteristics	8	What characteristics were reported about the interviewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	
Domain 2: Study design			
<i>Theoretical framework</i>			
Methodological orientation and Theory	9	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	
<i>Participant selection</i>			
Sampling	10	How were participants selected? e.g. purposive, convenience, consecutive, snowball	
Method of approach	11	How were participants approached? e.g. face-to-face, telephone, mail, email	
Sample size	12	How many participants were in the study?	
Non-participation	13	How many people refused to participate or dropped out? Reasons?	
<i>Setting</i>			
Setting of data collection	14	Where was the data collected? e.g. home, clinic, workplace	
Presence of non-participants	15	Was anyone else present besides the participants and researchers?	
Description of sample	16	What are the important characteristics of the sample? e.g. demographic data, date	
<i>Data collection</i>			
Interview guide	17	Were questions, prompts, guides provided by the authors? Was it pilot tested?	
Repeat interviews	18	Were repeat interviews carried out? If yes, how many?	
Audio/visual recording	19	Did the research use audio or visual recording to collect the data?	
Field notes	20	Were field notes made during and/or after the interview or focus group?	
Duration	21	What was the duration of the interviews or focus group?	
Data saturation	22	Was data saturation discussed?	
Transcripts returned	23	Were transcripts returned to participants for comment and/or	

Topic	Item No.	Guide Questions/Description	Reported on Page No.
		correction?	
Domain 3: analysis and findings			
<i>Data analysis</i>			
Number of data coders	24	How many data coders coded the data?	
Description of the coding tree	25	Did authors provide a description of the coding tree?	
Derivation of themes	26	Were themes identified in advance or derived from the data?	
Software	27	What software, if applicable, was used to manage the data?	
Participant checking	28	Did participants provide feedback on the findings?	
<i>Reporting</i>			
Quotations presented	29	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	
Data and findings consistent	30	Was there consistency between the data presented and the findings?	
Clarity of major themes	31	Were major themes clearly presented in the findings?	
Clarity of minor themes	32	Is there a description of diverse cases or discussion of minor themes?	

Developed from: Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 2007. Volume 19, Number 6: pp. 349 – 357

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BHASA (AFLOAT)

Baseline Survey Questionnaire

Question	Respondent's answer																								
Section G - Natural Disaster Details অধ্যায় G এর জন্য সাক্ষাৎকারে অংশগ্রহণকারী উত্তরদাতার নাম																									
উত্তরদাতার নাম (অধ্যায়-জি) Name of respondent interviewed for Section G নাম																									
আপনি কি কি ধরনের প্রাকৃতিক দুর্যোগের কথা জানেন? How many kinds of natural disasters can you think of? একাধিক উত্তর হতে পারে Multiple responses possible কি কি ধরনের প্রাকৃতিক দুর্যোগের	<table border="1"> <tr> <td>1</td> <td>সাইক্লোন/বড় ধরনের ঝড় Cyclones/big storms</td> <td>5</td> <td>রোগ Disease</td> </tr> <tr> <td>2</td> <td>বন্যা Flooding</td> <td>99</td> <td>জানিনা Don't know</td> </tr> <tr> <td>3</td> <td>সুনামি Tsunami</td> <td>97</td> <td>অন্যান্য (উল্লেখ করুন) Others (specify)</td> </tr> <tr> <td>4</td> <td>ভূমিধস Landslide</td> <td></td> <td></td> </tr> </table>	1	সাইক্লোন/বড় ধরনের ঝড় Cyclones/big storms	5	রোগ Disease	2	বন্যা Flooding	99	জানিনা Don't know	3	সুনামি Tsunami	97	অন্যান্য (উল্লেখ করুন) Others (specify)	4	ভূমিধস Landslide										
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5	What was the third most recent disaster event you	2	সাইক্লোন/বড় ধরনের ঝড় Cyclone
6	have experienced?	7	কালবৈশাখী Nor
7		8	নদী ভাঙ্গন Riverbank erosion
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14	Others (Specify)		
15	তখন আপনি কোন সতর্কবার্তা (দুর্যোগের সতর্কবার্তা)	1	হ্যাঁ Yes
16	শুনেছিলেন কি?	2	না No
17		90	মনে নেই Can't remember
18	Did you receive any warning message for the most		
19	recent disaster you experienced?		
20	সতর্কবার্তা শুনেছিলেন		
21	হ্যাঁ হলে, কোথায় থেকে দুর্যোগের সতর্কবার্তা	1	রেডিও Radio
22	শুনেছিলেন ?	2	টেলিভিশন Television
23		3	স্থানীয় প্রশাসনের প্রচারণা Announcement by local authority
24	If yes, where did you get the message from?	4	স্বচ্ছাসেবীদের প্রচারণা যেমন রেডক্রিসেন্ট/ফায়ার সার্ভিস ও সিভিল ডিফেন্স
25	কোথা থেকে শুনেছিলেন		Announcement by the volunteers (Red crescent, fire service and civil defence etc)
26		97	অন্যান্য (উল্লেখ করুন) Others (specify)
27			
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32	Others (Specify)		
33	দুর্যোগের সময় আপনারা কি কাছাকাছি কোন দুর্যোগ	1	হ্যাঁ Yes
34	সেন্টারে আশ্রয় নিয়েছিলেন?	2	না No
35	During the last disaster did you and your household		
36	members move to a nearby shelter?		
37	কোথাও আশ্রয় নিয়েছিলেন		
38	হ্যাঁ হলে কে / কারা আশ্রয় কেন্দ্রের ব্যবস্থা করেছে?	1	নিজ উদ্যোগে গিয়েছি Self-initiative
39	If yes, who put in place/organised the shelter?	4	এন জি ও NGO
40	কারা ব্যবস্থা করেছে	2	সরকারী আশ্রয় কেন্দ্র Government Shelter
41		97	অন্যান্য (উল্লেখ করুন) Others (specify)
42		3	স্থানীয় প্রশাসন Local Administration
43		99	জানি না Don't know
44		90	মনে নেই Can't remember
45	অন্যান্য (উল্লেখ করুন)		
46	Others (Specify)		
47	তখন আপনি কোথায় গিয়েছিলেন?	1	বন্যার্তদের জন্য সহায়তা কেন্দ্রে ^a Flood shelter
48	What type of centre did you go to?	4	কমিউনিটি কেন্দ্রে Community centre
49		2	সাইক্লোন শেল্টারে Cyclone shelter
50	কোথায় গিয়েছিলেন	5	আত্মীয়র বাড়িতে Relatives homes
51		99	জানি না Don't know
52			
53			
54	প্রধানত কি কারণে আপনি আশ্রয় কেন্দ্রে যেতে পারেন	1	প্রয়োজনে মনে করিনি Did not think it was needed
55	নি ?	4	এ ধরনের দুর্যোগ প্রায়ই হয়
56	What is the primary reason you did not go to the		Disaster is a common phenomenon
57	shelter/centre?	2	বাড়ীর জিনিস-পত্রের নিরাপত্তার কথা চিন্তা
58	কি কারণে যেতে পারেন নি		করে For the security of property
59		5	সাইক্লোন শেল্টার বেশ দুরে
60			Shelter is far away
		97	অন্যান্য (উল্লেখ করুন) Others (specify)

1 2 3 4 5 6 7 8 9 10	অন্যান্য (উল্লেখ করুন) Others (Specify) এ এলাকায় সাধারণত যে ধরনের অসুখ-বিসুখ হয় সে তুলনায় পানিতে ডুবা প্রতিরোধে কাজ করাটা কতটা গুরুত্বপূর্ণ বলে মনে করেন? [একটি উত্তর দিতে পরামর্শ করুন] Compared to other health problems you or your area face, how big a priority is it to reduce the risks associated with disasters that can lead to drowning? [Prompt for one response] গুরুত্বপূর্ণ বলে মনে করেন	1 2 3	1 তেমন গুরুত্বপূর্ণ নয় Low priority 2 কিছুটা গুরুত্বপূর্ণ Medium priority 3 অতি গুরুত্বপূর্ণ High priority		
11 12 13 14 15 16 17 18 19 20 21 22	(উত্তর বলে দিবেন না, উত্তরদাতাকে সবচেয়ে বেশি ক্ষতি হয়েছে এমন তিনটি বিষয় নির্বাচন করুন Do not prompt, give the respondent time to think and mark up to 3 options) আপনার মতে এসকল প্রাকৃতিক দুর্যোগে কি ধরনের ক্ষতি সবচেয়ে বেশি হয়ে থাকে? What were the main effects of the most recent natural disaster you experienced?	1 2 3 4 5	1 ইনজুরিজনিত অসুস্থতা Injury morbidity 2 মৃত্যু Death 3 ঘর-বাড়ী ধসে পড়ে Damage to infrastructure 4 মূল্যবান সম্পদের ক্ষতি Loss of productive assets 5 ফসলের ক্ষতি Loss of crops	6 7 8 9	আয় কমে যাওয়া Loss of income গবাদী পশু হারিয়ে যায়/মারা যায় Loss of livestock ঋণ গ্রস্ত হয়ে যায় Debt বিভিন্ন অসুখ-বিসুখ Disease
23 24 25 26 27 28 29 30 31 32 33	আপনার মতে এসকল প্রাকৃতিক দুর্যোগে কি ধরনের ক্ষতি সবচেয়ে বেশি হয়ে থাকে? What were the main effects of the most recent natural disaster you experienced?	1 2 3 4 5	1 ইনজুরিজনিত অসুস্থতা Injury morbidity 2 মৃত্যু Death 3 ঘর-বাড়ী ধসে পড়ে Damage to infrastructure 4 মূল্যবান সম্পদের ক্ষতি Loss of productive assets 5 ফসলের ক্ষতি Loss of crops	6 7 8 9	আয় কমে যাওয়া Loss of income গবাদী পশু হারিয়ে যায়/মারা যায় Loss of livestock ঋণ গ্রস্ত হয়ে যায় Debt বিভিন্ন অসুখ-বিসুখ Disease
34 35 36 37 38 39 40 41 42 43 44	আপনার মতে এসকল প্রাকৃতিক দুর্যোগে কি ধরনের ক্ষতি সবচেয়ে বেশি হয়ে থাকে? What were the main effects of the most recent natural disaster you experienced?	1 2 3 4 5	1 ইনজুরিজনিত অসুস্থতা Injury morbidity 2 মৃত্যু Death 3 ঘর-বাড়ী ধসে পড়ে Damage to infrastructure 4 মূল্যবান সম্পদের ক্ষতি Loss of productive assets 5 ফসলের ক্ষতি Loss of crops	6 7 8 9	আয় কমে যাওয়া Loss of income গবাদী পশু হারিয়ে যায়/মারা যায় Loss of livestock ঋণ গ্রস্ত হয়ে যায় Debt বিভিন্ন অসুখ-বিসুখ Disease
45 46 47 48 49 50 51 52 53 54 55	এই প্রাকৃতিক দুর্যোগে আপনার এলাকায় অবকাঠামোগত/ পরিবেশগত কি ধরনের ক্ষতি সবচেয়ে বেশি হয়েছে? What parts of your community infrastructure or environment are most affected by this natural disaster? (উত্তর বলে দিবেন না, উত্তরদাতাকে সবচেয়ে বেশি ক্ষতি হয়েছে এমন তিনটি বিষয় বলতে বলুন Do not prompt; select 3 most affected) অবকাঠামোগত ক্ষতি	1 2 3 4 5 6	1 ঘর-বাড়ি Houses 2 কৃষি জমি/ফসল Farmland 3 মাছ ধরার সামগ্রী Fishing resources 4 গাছ-পালা/বাগান Trees/forests/orchards 5 বিদ্যালয়- Schools 6 স্বাস্থ্য কেন্দ্র/ চিকিৎসা কেন্দ্র Health facilities	7 8 9 99 97	পানি ও পয়ঃনিষ্কাশন ব্যবস্থা Water and sanitation facilities রাস্তা- ঘাট Roads ব্রীজ/কালভার্ট Bridges জানি না Don't know অন্যান্য (উল্লেখ করুন) Other
56 57	অন্যান্য (উল্লেখ করুন)Others (Specify)				
58 59 60	এই প্রাকৃতিক দুর্যোগে আপনার এলাকার কোন ধরনের পেশাজীবীরা সবচেয়ে বেশি ক্ষতিগ্রস্ত? What kind of work or jobs in this area are most affected by this natural disaster? উত্তর বলে দিবেন না, উত্তরদাতার দেয়া প্রযোজ্য সব	1 2	1 জেলে Fisherman 2 মাঝি Boatman	6 7	ব্যবসায়ী Shopkeeper/businessman সরকারী চাকরীজীবী Government employee

<p>কয়টি উত্তর নির্বাচন করুন (Do not prompt; select as many as apply) পেশাজীবীদের ক্ষতি</p>	<table border="1"> <tr> <td>3</td> <td>রাখাল Livestock herder</td> <td>8</td> <td>পুলিশ/সামরিক বাহিনীর সদস্য Police/army</td> </tr> <tr> <td>4</td> <td>কৃষক Farmer</td> <td>99</td> <td>জানি না Don't know</td> </tr> <tr> <td>5</td> <td>দিন মজুর Wage labourer</td> <td>97</td> <td>অন্যান্য (উল্লেখ করুন) Other</td> </tr> </table>	3	রাখাল Livestock herder	8	পুলিশ/সামরিক বাহিনীর সদস্য Police/army	4	কৃষক Farmer	99	জানি না Don't know	5	দিন মজুর Wage labourer	97	অন্যান্য (উল্লেখ করুন) Other												
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1 2 3 4 5 6 7 8 9 10 11 12	information? (শীর্ষ ৩টি উত্তর চিহ্নিত করুন) (Mark top 3 choices) ব্যক্তি/প্রতিষ্ঠানের মধ্যে বেশী কার্যকর	4 5 6 7 8 97	স্কুল/কলেজ School/Colleges মসজিদ/মাদ্রাসা Mosque/Temple গণ্যমান্য ব্যক্তি Community leader স্থানীয় জনস্বাস্থ্য প্রতিষ্ঠান Public Health Department স্থানীয় সরকারী/বেসরকারী প্রতিষ্ঠান/ ক্লিনিক/সাইক্লোন সেন্টারের মাঠকর্মী Clinic/Outreach worker Government agencies, Cyclone preparedness programme, Local disaster management committee অন্যান্য (উল্লেখ করুন) Other (specify)
13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28	প্রাকৃতিক দুর্যোগকালীন জরুরী সতর্কবার্তা প্রচারের জন্য আপনার কাছে কোন পদ্ধতি বেশী কার্যকর বলে মনে হয়? In the event of a natural disaster, what is your preferred method of receiving emergency alert information? (শীর্ষ ৩টি উত্তর চিহ্নিত করুন) (Mark top 3 choices) জরুরী সতর্কবার্তা প্রচারে কোন পদ্ধতি বেশী কার্যকর	1 2 3 4 5 6 7 8 9 97	টেলিভিশন Television রেডিও Radio সংবাদপত্র/পত্রিকা Print Media বন্ধু-বান্ধবী/ পরিবারের সদস্য Friends/Family প্রতিবেশী Neighbors স্থানীয় দুর্যোগ ব্যবস্থাপনা কমিটি Local level disaster management committee স্থানীয় এনজিও Local NGOs স্বচ্ছাসেবী প্রতিষ্ঠান যেমন- রেড ক্রিসেন্ট সোসাইটি, স্কাউট-Voluntary organizations: Red Crescent society, Scouts মোবাইল/ম্যাসেজ Cell phones/text alerts অন্যান্য (উল্লেখ করুন) Other (specify)
29 30 31 32 33 34 35 36	অন্যান্য (উল্লেখ করুন)Others (Specify)		
37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54	প্রাকৃতিক দুর্যোগকালীন কিভাবে ঘর-বাড়ী, নিজে এবং পরিবারের সদস্যদের নিরাপদ রাখতে হবে সে বিষয়ে কখনো কোন তথ্য পেয়েছেন কি? Have you ever received any information on how to keep your household/members safe during a natural disasters? নিরাপদ রাখতে তথ্য পেয়েছেন কি	1 2	হ্যাঁ Yes না No
55 56 57 58 59 60	হ্যাঁ হলে, কোথায় থেকে এই তথ্য পেয়েছেন? If yes, from where did you receive this information from? (শীর্ষ ৩টি উত্তর চিহ্নিত করুন) (Mark top 3 choices) কোথায় তথ্য পেয়েছেন	1 2 3 4 5 6 7 8 9 10 97	টেলিভিশন Television রেডিও Radio সংবাদপত্র/পত্রিকা Newspaper গনমাধ্যম (লিফলেট ইত্যাদি) Print Media (pamphlet/flyer) বন্ধু-বান্ধবী/ পরিবারের সদস্য Friends/Family প্রতিবেশী Neighbors গণ্যমান্য ব্যক্তি/ধর্মীয় নেতা (ইমাম/পুরোহিত/ঠাকুর) Community leaders/Religious leaders মাঠকর্মী Outreach worker স্বাস্থ্যকর্মী Community health workers এনজিও কর্মী NGO workers অন্যান্য (উল্লেখ করুন) Other (Specify)
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	আপনার মতে, সংকটকালীন সময় সেবা ও তথ্য পাবার সম্ভাব্য বাধা/সমস্যাগুলো কি? What do you believe are potential barriers/problems to accessing emergencies services and information?	1 2 3	তথ্যের অভাব Lack of information করণীয় সম্পর্কে জ্ঞানের অভাব Lack of knowledge of what to do বর্তমান অবস্থান সম্পর্কে জ্ঞান না থাকা Lack of knowledge of current location

<p>(উত্তরদাতা যে কয়টি বলবে, সবক'টি বৃত্তায়িত করুন Select all that apply) সম্ভাব্য বাধা/সমস্যাগুলো কি</p>	<table border="1"> <tr> <td>4</td> <td>প্রাকৃতিক দুর্যোগের অবস্থান সম্পর্কে তথ্য না জানা এবং সম্ভাব্য গতিপথ সম্পর্কে ধারণা না থাকা Lack of knowledge where the natural disaster is located and/or where it is heading</td> </tr> <tr> <td>5</td> <td>যানবাহনের অভাব Lack of transportation</td> </tr> <tr> <td>6</td> <td>সম্পত্তির নিরাপত্তা Property security</td> </tr> <tr> <td>7</td> <td>ব্যক্তিগত নিরাপত্তা Personal safety</td> </tr> <tr> <td>97</td> <td>অন্যান্য (উল্লেখ করুন) Other (specify)</td> </tr> </table>	4	প্রাকৃতিক দুর্যোগের অবস্থান সম্পর্কে তথ্য না জানা এবং সম্ভাব্য গতিপথ সম্পর্কে ধারণা না থাকা Lack of knowledge where the natural disaster is located and/or where it is heading	5	যানবাহনের অভাব Lack of transportation	6	সম্পত্তির নিরাপত্তা Property security	7	ব্যক্তিগত নিরাপত্তা Personal safety	97	অন্যান্য (উল্লেখ করুন) Other (specify)												
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<p>আপনি যদি একটি প্রাকৃতিক দুর্যোগ মোকাবিলা করতে প্রস্তুত না হন, তবে এর কারণ নিচের কোনটি? What are the major reasons you don't feel prepared? (পড়ে শোনান;যতগুলো প্রয়োজন নির্বাচন করুন Read out, select all that apply) প্রস্তুত না হওয়ার কারণ</p>	<table border="1"> <tr> <td>1</td> <td>প্রস্তুত হতে অনেক সময়ের প্রয়োজন Takes too much time to become prepared</td> </tr> <tr> <td>2</td> <td>প্রস্তুত হতে অনেক টাকার প্রয়োজন Takes too much money to become prepared</td> </tr> <tr> <td>3</td> <td>কিভাবে প্রস্তুত হতে হবে তা জানা নেই Don't know how to prepare</td> </tr> <tr> <td>4</td> <td>মনে হয় প্রস্তুত হলেও তা ফলপ্রসূ হবে না Feel that preparing would not be effective</td> </tr> <tr> <td>5</td> <td>আমার অগ্রাধিকারের তালিকায় এটা আগের বিষয় নয় It's not high on my list of priorities</td> </tr> <tr> <td>6</td> <td>এখানে প্রাকৃতিক দুর্যোগ হবে বলে মনে করি না Don't think that disaster will occur here</td> </tr> <tr> <td>97</td> <td>অন্যান্য (উল্লেখ করুন) Other (specify)</td> </tr> </table>	1	প্রস্তুত হতে অনেক সময়ের প্রয়োজন Takes too much time to become prepared	2	প্রস্তুত হতে অনেক টাকার প্রয়োজন Takes too much money to become prepared	3	কিভাবে প্রস্তুত হতে হবে তা জানা নেই Don't know how to prepare	4	মনে হয় প্রস্তুত হলেও তা ফলপ্রসূ হবে না Feel that preparing would not be effective	5	আমার অগ্রাধিকারের তালিকায় এটা আগের বিষয় নয় It's not high on my list of priorities	6	এখানে প্রাকৃতিক দুর্যোগ হবে বলে মনে করি না Don't think that disaster will occur here	97	অন্যান্য (উল্লেখ করুন) Other (specify)								
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<p>যদি দুর্যোগের পূর্বাভাস পান, তাহলে আপনার নিজ খানায় আপনি কি প্রদক্ষেপ নিবেন? In your own household, what steps would you take if you heard about this last disaster was forecast? উত্তর বলে দিবেন না, উত্তরদাতার দেয়া প্রয়োজ্য সব কয়টি উত্তর নির্বাচন করুন Do not prompt, select all that apply পূর্বাভাস পেলে, খানায় কি প্রদক্ষেপ নিবেন?</p>	<table border="1"> <tr> <td>1</td> <td>সবাইকে একটি নিরাপদ স্থানে সরিয়ে নিবো Evacuate everybody to a safe place</td> </tr> <tr> <td>2</td> <td>সক্ষম ব্যক্তিদের একটি নিরাপদ স্থানে সরিয়ে নিবো Evacuate able people to a safe place</td> </tr> <tr> <td>3</td> <td>গুরুত্বপূর্ণ কাগজপত্র নিরাপদে রাখব Secure important documents</td> </tr> <tr> <td>4</td> <td>মূল্যবান জিনিসপত্র নিরাপদে রাখব Secure valuables</td> </tr> <tr> <td>5</td> <td>উৎপাদনশীল সম্পত্তি নিরাপদে রাখব Secure productive assets</td> </tr> <tr> <td>6</td> <td>গবাদি পশু নিরাপদ স্থানে সরিয়ে আনবো Bring livestock to safe areas</td> </tr> <tr> <td>7</td> <td>আপদকালীন সরবরাহ প্রস্তুত করব Prepare emergency supplies</td> </tr> <tr> <td>8</td> <td>ঘরটিকে বৃষ্টি/বাতাসের বিরুদ্ধে শক্তিশালী করবো Strengthen the house against wind/rain</td> </tr> <tr> <td>9</td> <td>কোনটিই নয় None</td> </tr> <tr> <td>99</td> <td>জানা নেই Don't know</td> </tr> <tr> <td>97</td> <td>অন্যান্য (উল্লেখ করুন) Other (specify)</td> </tr> </table>	1	সবাইকে একটি নিরাপদ স্থানে সরিয়ে নিবো Evacuate everybody to a safe place	2	সক্ষম ব্যক্তিদের একটি নিরাপদ স্থানে সরিয়ে নিবো Evacuate able people to a safe place	3	গুরুত্বপূর্ণ কাগজপত্র নিরাপদে রাখব Secure important documents	4	মূল্যবান জিনিসপত্র নিরাপদে রাখব Secure valuables	5	উৎপাদনশীল সম্পত্তি নিরাপদে রাখব Secure productive assets	6	গবাদি পশু নিরাপদ স্থানে সরিয়ে আনবো Bring livestock to safe areas	7	আপদকালীন সরবরাহ প্রস্তুত করব Prepare emergency supplies	8	ঘরটিকে বৃষ্টি/বাতাসের বিরুদ্ধে শক্তিশালী করবো Strengthen the house against wind/rain	9	কোনটিই নয় None	99	জানা নেই Don't know	97	অন্যান্য (উল্লেখ করুন) Other (specify)
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<p>আপনার খানায় কি বর্তমানে নিম্নোক্ত জিনিসগুলো আছে? Does your household currently have any of the following? (পড়ে শোনান;যতগুলো প্রয়োজন নির্বাচন করুন Read out, select all that apply) খানার সম্পদ</p>	<table border="1"> <tr> <td>1</td> <td>সর্বসম্মত নিরাপদে সরে যাবার স্থান An agreed place to evacuate to</td> </tr> <tr> <td>2</td> <td>যারা এখানে বাস করেন তাদের প্রত্যেকের ৩দিনের পানি সরবরাহ (একজনের প্রতিদিন ১গ্যালন করে) 3-day supply of water (1 gallon of water per person per day) for everyone who lives there</td> </tr> <tr> <td>3</td> <td>যারা এখানে বাস করেন তাদের প্রত্যেকের ৩দিনের অপচনশীল খাবার সরবরাহ 3-day supply of non-perishable food for everyone who lives there</td> </tr> <tr> <td>4</td> <td>পরিবারের যে সকল সদস্যর ঔষধ প্রয়োজন, তাদের ৩দিনের ঔষধ 3-day supply of medicine for each family member who requires medication</td> </tr> </table>	1	সর্বসম্মত নিরাপদে সরে যাবার স্থান An agreed place to evacuate to	2	যারা এখানে বাস করেন তাদের প্রত্যেকের ৩দিনের পানি সরবরাহ (একজনের প্রতিদিন ১গ্যালন করে) 3-day supply of water (1 gallon of water per person per day) for everyone who lives there	3	যারা এখানে বাস করেন তাদের প্রত্যেকের ৩দিনের অপচনশীল খাবার সরবরাহ 3-day supply of non-perishable food for everyone who lives there	4	পরিবারের যে সকল সদস্যর ঔষধ প্রয়োজন, তাদের ৩দিনের ঔষধ 3-day supply of medicine for each family member who requires medication														
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1		5	ব্যাটারী চালিত রেডিও Battery operated radio		
2		6	ব্যাটারী Batteries		
3		7	টর্চলাইট Flashlight		
4		8	প্রাথমিক চিকিৎসা সরঞ্জাম First Aid Kit		
5		9	জেনারেটর Generator		
6		10	কম্বল Blankets		
7		12	এগুলোর কোনোটাই আমার নেই I don't have any of these items		
11	[যদি নিরাপদে সরে যাবার স্থান নির্বাচিত থাকে] নিরাপদে সরে যাবার স্থানটি কোথায়? [If evacuation point selected] Where is the evacuation point? উত্তর বলে দিবেন না, উত্তরদাতার দেয়া প্রযোজ্য সব কয়টি উত্তর নির্বাচন করুন Do not prompt, select all that apply স্থানটি কোথায়	1	ঝড় আশ্রয়কেন্দ্র Storm shelter	4	বড় ঘর Big house
12		2	মসজিদ Mosque	5	উঁচু জমি High ground
13		3	স্কুল/কলেজ School/College	99	জানি না Don't know
14				97	অন্যান্য (উল্লেখ করুন) Others, specify
15	অন্যান্য (উল্লেখ করুন)Others (Specify)				
22	[If evacuation point selected] [যদি নিরাপদে সরে যাবার স্থান নির্বাচিত থাকে] এলাকাটি কতটুকু নিরাপদ বলে আপনি মনে করেন? How safe do you think this area is? (একটি নির্বাচন করুন Prompt, select one) কতটুকু নিরাপদ	1	নিরাপদ নয় Unsafe	3	নিরাপদ Safe
23		2	মোটামুটি নিরাপদ Somewhat safe	4	নিশ্চিত নয় Not sure
28	এই (প্রাকৃতিক দুর্যোগের) পূর্বাভাস পাবার পরও আপনার পরিবারের কিছু বা সকল সদস্যও নিরাপদ স্থানে সরে না যাবার কি কোনো কারণ আছে? Are there any reasons why some or all of your household members did not evacuate when you heard the most recent natural disaster was forecast? (উত্তর বলে দিবেন না, উত্তরদাতা যে কয়টি বলবে, সবকটি বৃত্তায়িত করুন Do not prompt, select all that apply) নিরাপদ স্থানে সরে না যাবার কারণ	1	এখানেই যথেষ্ট নিরাপদ Safe enough here		
29		2	নিরাপদে সরে যেতে প্রচুর অর্থ বা সময়ের প্রয়োজন Too expensive or time-consuming to evacuate		
30		3	সরে যেতে ভয় হয় Afraid to leave		
31		4	সম্পত্তি দেখাশোনা করার জন্য থাকতে হবে Need to stay to look after property		
32		5	পূর্বাভাসের উপর ভরসা নেই Forecasts are not reliable		
33		6	না, আমরা সবাই নিরাপদ স্থানে সরে যাবো No, we would all evacuate		
34		99	জানি না Don't know		
35		97	অন্যান্য (উল্লেখ করুন) Other (specify)		
41	অন্যান্য (উল্লেখ করুন)Others (Specify)				
43	এই প্রাকৃতিক দুর্যোগে যদি আপনার খানায় ক্ষতি হয়, তাহলে আপনি সাহায্যের জন্য কার উপর ভরসা করবেন? If your household suffered as a result of [this natural disaster], who could you rely on to help you? (উত্তর বলে দিবেন না, উত্তরদাতা যে কয়টি বলবে, সবকটি বৃত্তায়িত করুন Do not prompt, select all that apply) সাহায্যের জন্য কার উপর ভরসা করবেন	1	বন্ধু বা প্রতিবেশী Friends or neighbours		
44		2	আত্মীয় - স্বজন Relatives		
45		3	এলাকার সম্ভ্রান্ত/ধনী মানুষ Elite/rich people in the area		
46		4	ধর্মীয় নেতৃবৃন্দ Religious leaders		
47		5	সরকারী কর্তৃপক্ষ Government authorities		
48		6	উদ্ধারকারী দল/ স্বচ্ছসেবক দল Savings groups / self-help groups		
49		7	এন.জি.ও সমূহ NGOs		
50		8	কারো কাছ থেকে নয় Nobody		
51		99	জানি না Don't know		
52		97	অন্যান্য Other (specify)		
58	অন্যান্য (উল্লেখ করুন)Others (Specify)				

Supplementary File 3. In-depth interview guide and focus group discussion guide for community members with disaster experience

Topics to address in this IDI guide:

- Investigate the impact of aquatic disasters (natural and human) on the community
- Explore current disaster preparedness practices/resilience
- Understand role and measure in disaster relief management associated with drowning
- Explore health seeking behaviours of disaster related drowning events

(Questions only for volunteer leaders are underlined)

Demographic questions		
1.	Gender of participant:	Male Female
2.	Age of participant (in years):	
3.	Occupation of participant:	
4.	Role in the community:	
5.	<u>Are you associated with any organisation? (if volunteering from an organisation)</u>	

Themes	Queries	Probe/ clarifications/remarks
Introduction		
Background information	Explore participant background information	<p>-Can you please tell me your name and for how long you have you lived in this community?</p> <p>-What is your position in the community? How long have you been in this position?</p> <p>-What are your main responsibilities within the community before/during/after a disaster?</p>
Investigate the impact of aquatic disasters (natural and human) on the community		
	Explore general perceptions of disasters	<p>-What do you know about disasters such as floods, cyclones etc? What do you think causes them?</p> <p>Have you ever received any education or training about natural disasters? If yes, from where/whom? What did you learn about? Was it useful?</p> <p>-Do you classify disasters as emergency situations? Why/why not?</p> <p>-Can the damage caused by a disaster be prevented/lessened? If yes or no, then why?</p>
Explore current disaster preparedness practices/resilience		
	Explore safety perception regarding disasters	<p>-What are some major safety issues that arise during a disaster? Please explain.</p> <p>-Do you think children/women/disabled people are safe during disasters? If yes or no, then why? What are the specific safety issues for these groups? How can their safety be improved during a disaster?</p> <p>-Do you know of any people who have drowned due to a disaster? If yes, please provide details. Do you think this could have been avoided? If yes, then how?</p>
	Existing practices to protect against disaster	-What are some ways used for protecting people and households from flooding and other disasters? How did you and/or the community find out about this?

1		-Do many community members use these methods? Do you use these methods? If yes or no , then why? Do you think they are adequate to keep your household and family safe?
2		
3		
4		
5		
6		<u>-Do you assist community members in implementing disaster preparedness systems? If yes, do you receive any support from government for this?</u>
7		
8		
9		
10	Existing practices during a disaster	-Does your community have a disaster management committee? If yes , who is part of it?
11		
12		-Does your community have any kind of plan to deal with disasters? If yes , please describe. If no , why? Do you know if a risk assessment has ever been performed for the area?
13		
14		-Has the community ever practiced responding to a disaster? Did you participate in this drill?
15		
16		- Who do you think plays an important role in responding to disasters in your area?
17		
18		-What systems are in place to warn community members when a disaster is approaching? If yes , who is responsible for running this?
19		
20		<u>-Do you have a role in warning the community? If yes, how do you know when to begin? Who leads the operation? How many other people work alongside you? What instructions do you provide community members with? Do you receive any support from government?</u>
21		
22		-What do community people generally do during a disaster? How do they try to stay safe?
23		
24		-Do community people use local cyclone centres? If no , then why?
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38	Existing practices following a disaster	-What happens after the disaster? How does community come back to their day to day activities?
39		
40		<u>-Do you have a role in post-disaster clean-up? If yes, what does this involve? Who coordinates clean-up efforts? Do you receive any support from government?</u>
41		
42		
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44		
45		-What is done if parts of the community are no longer safe to be in/around (unstable infrastructure, flooded areas etc)?
46		
47		<u>- What do you think your area needs to help it better prepare and respond to disasters?</u>
48		
49		
50		
51	Understand role and measure in disaster relief management associated with drowning	
52	To identify key responsibilities and involvement with disaster and drowning	-Have you personally assisted with any drowning cases? If yes , please provide detail. How could you have been better supported to handle these people?
53		
54		
55		
56	Explore health seeking behaviours of disaster related drowning events	
57	Health seeking behaviours post-drowning due to disaster	-What health facilities are available during/directly following a disaster? Are these different from regular health facilities? Are they appropriate/adequate for the community's needs?
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59		-What health facilities do you think are needed to treat community members following a disaster? What are
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		<p>some important features these services should have? Do you have any thoughts or preferences about who could provide these? <i>[Probe: government, NGO, other organisation]</i></p>
Exit Questions		
<p>During our conversation, you mentioned W, X, Y, Z measures that could be taken to improve disaster preparedness for the community (and or post disaster measures) during or directly following a disaster. If you were to rank these from 1 to 5 (1 being most helpful and 5 least helpful in your community), what would the order be? And why? <i>[probe with high risk group- community need, feasibility, acceptability, sustainability]</i></p>		

For peer review only

1 Topics to address in this FGD guide:

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- Investigate the impact of aquatic disasters (natural and human) on the community
 - Explore current disaster preparedness practices/resilience
 - Explore health seeking behaviours of disaster related drowning events
 - Understand role and measure in disaster relief management associated with drowning
- 7

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9 **Introduction**

10 **Introductory statement**

11 Welcome, and thank you for agreeing to be part of today's focus group discussion. We appreciate your willingness
12 to participate and the time you have taken out of your day to take part.

13

14 My name is.....and I am from the Centre for Injury Prevention and Research, Bangladesh in Dhaka. We
15 are conducting these discussions with members of the Barisal community who have experienced natural or human
16 disaster. Our aim is to understand your views and experiences in relation to disaster-related drowning so that we
17 can find out the best way to reduce it in Bangladesh and in your communities. We would like to find out from you
18 what your thoughts/opinions and concerns are about drowning and how we can work together with you to reduce
19 drowning related deaths and disabilities in your communities.

20

21 First I would like to cover some general rules about how this discussion will run:

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1. We would like you all to do the talking and to hear from everyone in the group.
 2. Only one person should speak at a time so please wait for the person talking to finish.
 3. There are no right or wrong answers – every person's opinion and view is important and we would like to hear a range of different views.
 4. Anything discussed in this room remains in this room. We want everyone to feel comfortable about discussing any sensitive issue.
 5. We will be recording these discussions because we want to capture everything you have to say accurately. But please be assured that we do not identify anyone by name in any report and your identity will remain anonymous.
 6. Does anyone have any questions?

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33 **Explore participant background**
34 **information**

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Now I would like everyone to introduce themselves. Can you please tell us your name, age, occupation if any, and for how long you have been in this community for?

Theme	Discussion point	Probes/clarifications
Investigate the impact of aquatic disasters (natural and human) on the community		
Awareness/ Perception - <u>general</u>	<ul style="list-style-type: none"> ▪ What are some major safety issues that arise during a disaster? ▪ What about drowning? Who do you think is most at risk of drowning during a disaster? 	<ul style="list-style-type: none"> - When have you previously felt unsafe during a disaster? - Are children/women/disabled people more prone to drowning during disasters?
Explore current disaster preparedness practices/resilience		
Risk behaviours	<ul style="list-style-type: none"> ▪ What are some of the reasons community members drown during a disaster? 	<ul style="list-style-type: none"> - What types of disaster cause an increased risk of drowning? - Are there appropriate facilities and services available to prevent drowning/assist people who are drowning?
Current practices	<ul style="list-style-type: none"> ▪ How do you ensure that you and your family are prepared for a disaster? 	<ul style="list-style-type: none"> - What types of preparations do you make to your household prior to disaster? Where did you learn about these? - How do you receive warning when a disaster is approaching?

		- Do you and your household have an evacuation plan? What is it?
Barriers	- What are the barriers to ensuring you are prepared for disaster?	- What are the main barriers to making appropriate safety preparations before a disaster occurs? How could these barriers be minimised?
Explore health seeking behaviours of disaster related drowning events		
Experience of drowning events	<ul style="list-style-type: none"> ▪ Do you know of any people who have drowned due to a disaster? If yes, please describe the event. Please describe the situation. What happened? How and when did this happen? 	<ul style="list-style-type: none"> - Do you know if anyone attempted to help them? If yes, who and how? - How do you think this could have been prevented?
During drowning event	- How are people usually rescued in drowning situations during a disaster?	- Who are the people involved in the rescue and what are the associated risks for them?
Post drowning event	- Do you know what the usual immediate practices are after a person is recovered from water?	<ul style="list-style-type: none"> - Would you personally be confident in administering these? - What health facilities are available to treat drowning during/directly following a disaster? Are these adequate/appropriate?
Understand role and measure in disaster relief management associated with drowning		
	- What can be done to reduce the impact of a natural disaster in your community?	<ul style="list-style-type: none"> - What sort of programs, resources or facilities would be required for this? - Who do you think are best placed for implementing and overseeing this?
	- What is currently available to the community to prepare them for disaster?	- Have you ever received any kind of information about natural disasters? If yes, from where/whom? What did you learn? Was it useful?
Exit question		
<p>During our conversation, W, X, Y, Z measures were mentioned that could be taken to reduce drowning amongst fishermen. If you were to rank these from 1 to 5 (1 being most helpful and 5 least helpful for your community), what would the order be?</p> <p>Does anyone have any other questions or anything you would like to say or discuss further in this group?</p>		

Supplementary File 4. Key subthemes from qualitative analysis with illustrative quotes

Theme	Key sub-themes		Illustrative quotes
Perceptions of risk and consequences of disaster	1. Perceived causes of disaster	1a. Beliefs	<i>"And why these happen, I cannot say. Allah wishes - that's why it happens brother. Everything happens when Allah wishes." (P2, M, fisherman and shop owner)</i>
		1b. Climate change	<i>"Car, launch, steamer; all these release smoke which is harmful for nature and for that reason disaster takes place."(FGD2, M, small business owners))</i>
	2. Outcomes of disaster	2a. Loss of human life	<i>"We saw many dead bodies of people beside the road." (FGD1, M, business men and fishermen)</i>
		2b. Loss of livestock, agricultural land and produce	<i>"What is more problem is, the fishes of the pond go away. Because of this, the people suffer from financial problems. They lose everything." (P6, F, social worker)</i>
			<i>"The storm destroyed all the crops. I don't know whether we will get any rice or not from the grain." (FGD3, F, housewives)</i>
		2c. Damaged households	<i>"Now look at that broken house which is left there. That house was made newly, it was built only two to three months ago. Suddenly it was hit by the storm." (P7, F, housewife and NGO employee)</i>
		2d. Theft	<i>"We stay at home because if we leave the house the things will be stolen. We have nothing else than these things of the house. That's why we try to stay at the houses long as we can." (P3, M, agricultural worker)</i>
		2e. Damaged public infrastructure	<i>"Children cannot go to school and people have to swim to cross the roads. [The market] and cooking became a great problem." (FGD4, F, housewives)</i>
2f. Illness	<i>"When water comes during calamity, if people drink that water, people suffer from many diseases." (P6, F, social worker)</i>		
Insufficient support for the most vulnerable	3. Increased vulnerability to disaster	3a. Gender issues	<i>"During this time [women] are considered as a burden by other members of the family. They cannot move quickly, cannot come quickly." (P6, F, social worker)</i> <i>"Women are in risk because they wear many clothes and they have long hair. That hair might be untied and get stuck or twisted with anything else. They</i>

			<i>don't have that much strength. So they cannot free themselves." (FGD2, M, businessmen and fishermen)</i>
		3b. Dependence on others	<i>"Children can't move alone and don't know how to swim. Someone is needed to guard them. Sometimes kids get lost when they are moving with their parents as we can hold something to stay safe, but the kids can't." (P3, M, agricultural worker)</i>
		3c. Close proximity to water	<i>"All of us who were staying near the river bank, lost everything. Everything was broken down." (P4, M, fisherman and labourer)</i>
Community preparedness and practices	4. Preparing for disaster	4a. Preparation of food and resources	<i>"And we arrange everything properly and tie up with the beam, so that later on we can get everything in proper order." (FGD2, M, businessmen and fishermen)</i>
		4b. Modifications made to households	<i>"We put poles to support the house so that it doesn't fall. We take a thick rope and tie up one end of that rope with the house and tie up the other end of rope with a big tree tightly, so that the house doesn't fall during cyclone." (FGD3, F, housewives)</i>
		4c. Self-made safety equipment	<i>"We make some floating materials with plastic bottle of soft drink, or plastic water bottle etc. I made those floating materials for all the members of my family." (P6, F, social worker)</i>
		4d. Education provided by government and NGOs	<i>"Now everyone has got training. Everyone knows what is to be done, if there is cyclone. The people of coastal area have now become more conscious." (P6, F, social worker)</i>
	5. Protection at time of disaster	5a. Heterogeneity in mode of communication	<i>"We receive information through radio and television. We even get to know what type of disaster is coming. We received signals during Aila. Mic was used in our area to aware people." (P1, M, assistant teachers)</i>
		5b. Lack of compliance to warning systems	<i>"And another thing is people don't want to go. As long as possible they try to stay in their own place. If they have left their things in that place then they might have lost their things. People don't want to leave their resort in their entire life. That's why problem increases more and people get hurt more by drowning in water." (FGD1, M, small business owners)</i>
		5c. Reliance on cyclone shelters for protection	<i>"If we get information about flood, then we will have to move to [the cyclone shelter]. Apart from this we don't have any alternative." (FGD3, F, housewives)</i>

		5d. Cyclone shelters not meeting community needs	<p><i>“Cyclone centres are located far from this place. If these are located near to us then it would be possible to go to cyclone centre.” (FGD2, M, business men and fishermen)</i></p> <p><i>“Suppose there are two cyclone centres in our area. Already cracks have been developed in one building. Moreover they become filled up with people at the time when signal is shown.” (FGD2, M, business men and fishermen)</i></p>
		5e. Use of other resilient infrastructure for shelter	<p><i>“We took shelter in those people’s houses which were better means [than our house]. We took shelter in those houses which had strong foundation.” (FGD1, M, small business owners)</i></p>
		5f. Use of Indigenous floatation methods	<p><i>“We use banana tree to keep ourselves floating. When there is a flood, we cut down banana trees. This is the local method. By using these accessories, we can reduce drowning.” (P1, M, assistant teacher)</i></p>
Barriers to disaster response and improving resilience	6. Survival skills, rescue and resuscitation	6a. Lack of survival skills	<p><i>“A man in the north was totally puzzled and could decide which way to go with his old father. Then he was thinking whether he will save himself or will take his father. Then he tied up his father with a tree so that even if he dies at least his dead body will be found. Later on his father died tied up with that tree. Later, he was buried in the morning.” (FGD1, M, small business owners)</i></p> <p><i>“My grandson was seven months old. We put quilt, pillow in a big metallic utensil and then put him there and then said, ‘We are old. We cannot go to the marshy land, we cannot take him. Let him float on water. If Allah grants him life line then somehow he will survive and if he has no life line, then he will not be in this world anymore.” (FGD3, F, housewives)</i></p>
		6b. Rescue is a high-risk practice	<p><i>“While saving anyone from drowning he may also die. They have also several risks, like trees or boughs may break and fall on them.” (FGD4, F, housewives)</i></p>
		6c. Resuscitation using traditional methods	<p><i>‘[A] clay pot is grinded like powder and that powder is rubbed on the body. Then body has to cover with cotton so that water can release from his body. And if his body is moved taking his body on head, then he will remain alive.” (FGD3, F, housewives)</i></p>

	6d. Minimal access to health facilities post-event	<i>"If someone gets injured by accident then we have hospital here but don't have doctor. If someone gets seriously injured by accident in that case we have nothing to do." (FGD2, M, business men and fishermen)</i>
7. Disaster relief	7a. Multiple parties are involved in relief	<i>"Then there were help from many places. Not only the government, but also many states of the world helped then. We helped people [too]; providing various relief: medicines, foods. We volunteered in these tasks." (P2, M, fisherman and shop owner)</i>
	7b. Bribery and nepotism control relief distribution	<i>"At that time [those] who could give money as bribe he got that house and money. But [those] who actually needed he did not get the house and money." (FGD1, M, small business owners)</i>
8. Improving disaster resilience	8a. Improve community awareness	<i>"Here I would like to emphasize that if the people are given more training on calamity, then I think the risk might be reduced to some extent. Training has to be imparted to all." (P6, F, social worker)</i>
	8b. Provision of floatation devices and signals	<i>"People like us can try to survive if given a ring buoy or life jacket. By the grace of Allah we might be able to live." (FGD2, M, business men and fishermen)</i>
	8c. Generate political will	<i>"We don't have any idea who will do it for us. There is no benefit in asking to the members or the chairman. During the election they promise us a lot of things which ultimately they don't fulfil." (FGD4, F, housewives)</i>
	8d. Construct more cyclone centres	<i>"Cyclone centre are not constructed where they are supposed to be constructed. These are constructed in the area where people have power and influence. It would have been very helpful to the people if these centres could be built after every one and one and half kilometres." (FGD1, M, small business owners)</i>
	8e. Improve housing standards	<i>"If good strong houses can be made, then they can stay much safer. See everyone don't have the ability to build strong a house. For them, suppose, if a strong firm house can be made after every 4th or 5th house, then they can take shelter there. Storm will not bother much then." (P2, M, fisherman and shop owner)</i>
	8f. Construct more embankment s, barriers and dams	<i>"If block made of cement or concrete can be thrown beside the river bank then the people who live beside the river will remain well. And flood water will not be able to come easily. The river is breaking down in</i>

1			<i>such a way this place will not last long.” (FGD1, M, small business owners)</i>
2			
3		8g. Provide	<i>“When there is a disaster or flood, then if a service</i>
4		post-disaster	<i>centre is established, it will be very good for us. The</i>
5		medical	<i>sick need not to be taken to remote areas. Their</i>
6		service in	<i>treatment can be managed from here.” (P2, M,</i>
7		community	<i>fisherman and shop owner)</i>
8			
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10		8h. Use	<i>“If anything is announced from mosque, people give</i>
11		mosques for	<i>more importance to it and obey it. Again if Imam</i>
12		warning	<i>discusses these things, then people will be able to</i>
13		signals and	<i>know more.” (FGD1, M, small business owners)</i>
14		shelter	
15			
16		8i. Increase	<i>“You can plant many trees on the coastal area. That</i>
17		tree	<i>will save us from the stormy wind. But people don’t</i>
18		plantations	<i>plant trees because many of them have no place, no</i>
19			<i>land or no money.” (FGD2, M, business men and</i>
20			<i>fishermen)</i>
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