Residential district multi-hazard risk is associated with childhood undernutrition: evidence from Bangladesh

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ABSTRACT
Child undernutrition and natural disasters are major public health concerns in Bangladesh, but research into their relationship is lacking. This study assessed the association between residential district multi-hazard-risk and undernutrition among children aged less than 5 years (under-5) in Bangladesh. Data for 22,055 under-5 children were extracted from the 2019 Multiple Indicator Cluster Survey of Bangladesh. Multi-hazard risk was categorized as low (score<10), moderate (score 10–20), and high (score>20) using a combined score of four major hazards: tornado, cyclone, earthquake, and flood. We found that children from high multi-hazard risk districts were 19% more likely to be stunted and 23% more likely to be underweight compared to low-risk districts. However, wasting was not associated with multi-hazard risk. Strategies such as agricultural adaptation and coping mechanisms, long-term post-disaster nutritional response, extended periods of relief supports, and enhanced quality maternal and child care services may help to reduce undernutrition burdens in Bangladesh.

Introduction
Undernutrition affects many children worldwide and is associated with an increased risk of child mortality (Caulfield et al. 2004). Global undernutrition burden among children decreased over time; for example, stunting, wasting, and underweight rates reduced by 35%, 8%, and 36% between 1990 and 2011, respectively (Black et al. 2013). Given this global downturn, the burden of undernutrition is still surprisingly high in Asia, resulting in a significant public health problem (Black et al. 2013). Bangladesh is a South Asian country where a substantial proportion of children are suffering from undernutrition. Evidence shows that progress has been made in reducing undernutrition in Bangladesh. Stunting among children aged less than 5 years (under-5) decreased from 51% in 2004 to 36% in 2014, while underweight prevalence among under-5 children dropped from 43% in 2004 to 33% in 2014. In contrast, wasting increased from 15% in 2004 to 17% in 2007 and has declined gradually since then, to 14% in 2014 (National Institute of Population Research and Training, ICF International, Mitra and Associates 2016). Given the population size, the absolute number of undernourished children is very high, making it challenging to achieve the Sustainable Development Goal 2.2 – to end malnutrition by 2030 (Haddad et al. 2015). Undernutrition results from a complex interaction between several factors, including demographic, socioeconomic,
cultural, food security, dietary diversity, water, sanitation and hygiene (WASH), repeated disease, and climate change (Akachi et al. 2009). In fact, studies in different countries have identified climatic factors as a significant predictor of child undernutrition (Johnson and Brown 2014; Hagos et al. 2014; Kinyoki et al. 2016; Khan et al. 2020). Climate change could alter the trend of many extreme weather events or disasters (Kousky 2016), which could potentially affect the nutritional status of children.

Children are directly or indirectly vulnerable to natural disasters, especially when exposed to these natural calamities during their critical growth phases (Doostgharirin 2009; Datar et al. 2013). Disaster can affect the nutritional status of children through many interrelated routes, including injury, illness, poverty, displacement, hunger, and less access to health care (Gaire et al. 2016). Research in Ethiopia shows that concurrent and long-term exposure to drought was negatively associated with child height (Bahru et al. 2019). In Nicaragua, children from birth to four years old who had experienced the storm were more likely to be undernourished (Baez and Santos 2007). A study conducted in India shows that the likelihood of stunting and underweight among children increases with exposure to disaster (Datar et al. 2013). In rural eastern India, the prevalence of child wasting was substantially increased among children residing in flooded communities relative to those residing in non-flooded communities (Rodriguez-Llanes et al. 2016). A study in Bangladesh shows that children exposed to the flood were smaller than those not exposed to the flood (Del Ninno and Lundberg 2005).

Including Bangladesh, many areas of the world are prone to several natural hazards, and effective risk reduction is only possible if all relevant threats are considered and analyzed (Kappes et al. 2012). Therefore, the application of the multi-hazard approach, an approach that considers more than one hazard in a given place (ideally progressing to consider all known hazards) and the interrelations between these hazards, including their simultaneous or cumulative occurrence and their potential interactions (Gill and Malamud 2016), is gaining momentum nowadays in disaster management and disaster risk reduction. Evidence shows that when a region is prone to multiple hazards, these hazards often interact and generate a cascading effect (Aksha et al. 2020). For example, a tropical cyclone can cause a tidal surge, which can lead to breaching of flood protection embankments, ultimately resulting in flooding, which may have a more detrimental effect on human lives in the long run than the triggering hazard itself. Thus, a high-risk multi-hazard zone has a higher likelihood of multiple disasters and is susceptible to greater impacts on human lives from exposure to these multiple disasters than an area prone to a single disaster. The association between a single hazard and childhood undernutrition has been explored in some past studies (Del Ninno and Lundberg 2005; Doostgharin 2009; Datar et al. 2013; Bahru et al. 2019; Baten et al. 2020; Shaw et al. 2020). There was a paucity of research to examine the association between multi-hazard risk and undernutrition among under-5 children in Bangladesh.

In the present study, we aimed to assess the association between residential district multi-hazard risk and undernutrition (stunting, underweight, and wasting) among under-5 children in Bangladesh. We hypothesized that children from high multi-hazard risk districts are more likely to be undernourished. Exploring the association between multi-hazard risk and childhood undernutrition may help inform strategies to promote and protect the nutritional status of children in vulnerable areas.

**Methods**

**Study design and participants**

A secondary dataset from the latest Multiple Indicator Cluster Survey (MICS) Bangladesh 2019 was used for the present analysis (BBS and UNICEF Bangladesh 2019). The 2019 MICS was a nationally representative survey that used two-stage stratified random sampling to provide nationally representative statistics for different indicators. The details about the sampling design, data collection,
data quality measures, and other relevant information can be found in the survey report (BBS and UNICEF Bangladesh 2019). In this study, we extracted data on 23,099 under-5 children. Among them, 1044 children were excluded from the analysis due to missing height or weight, flagged cases (implausible height or weight measurements), or missing in the predictor variable. Finally, this study considered 22,055 children who have complete information on the outcome and the predictor variable of interest.

**Measures**

**Outcomes**
In this study, the outcome variables to characterize childhood undernutrition were stunting, wasting, underweight, and any form of undernutrition. A child more than two standard deviations (SD) below the median of the WHO reference population in terms of height-for-age z-score (HAZ <-2), weight-for-height z-score (WHZ <-2), and weight-for-age z-score (WAZ <-2) was classified as stunted, wasted, and underweight (WHO 2006), respectively.

**Predictor**
The primary predictor variable of this study was the district-level multi-hazard score, a combined score of four major hazards such as tornado, cyclone, earthquake, and flood. The score was proposed by Barua and colleagues (Barua et al. 2016) for Bangladesh. The detailed calculation of the score can be found in the article (Barua et al. 2016). Briefly, hazard scores for four major hazards in Bangladesh were calculated using two steps: 1) calculate the district-specific hazard factor based on intensity and damage risks of hazards, and 2) multiply the hazard factor and the weight factor for particular hazards for each of the 64 districts in Bangladesh. The overall multi-hazard score was ranged from 7.4 to 26.8. The authors (Barua et al. 2016) categorized the score as low (score 1–10), moderate (score 10–20), and high (score 20–30) multi-hazard zone; we adapted this in our study.

**Control variables**
A set of control variables considered in this study were individual-level – child’s age (months), sex (boys, girls), comorbidity (diarrhea episode, acute respiratory infections, or fever) status in the last two weeks (yes, no), maternal-level – maternal education (pre-primary or none, primary, secondary, and higher), household-level – wealth index (continuous), source of drinking water (improved, unimproved), type of toilet (hygienic, unhygienic), shared toilet facility (yes, no), and community-level – the place of residence (rural, urban). In this survey, the wealth index was calculated based on household-level asset variables using principal component analysis (BBS and UNICEF Bangladesh 2019). The UNICEF and WHO Joint Monitoring Program’s operational definition (UNICEF and WHO 2015) was used to define improved water supply and hygienic sanitation facilities. These adjusted factors were previously found to be potential confounders or risk factors of undernutrition in the Bangladesh context (Chowdhury et al. 2016; Sarma et al. 2017; Mistry et al. 2018).

**Statistical analysis**
All analyses properly incorporated survey features (i.e., cluster, strata, and sampling weight) to account for the complex survey design of MICS. Descriptive statistics were calculated to summarize all variables. We used the Rao-Scott Chi-square test to assess the unadjusted bivariate associations of undernutrition with the multi-hazard risk and control variables. The design-adjusted (accounted for survey features) multivariable modified Poisson regression model was used to explore the association between undernutrition and multi-hazard risk. Our initial goal was to run a binomial regression model with the log link function to assess the relationship. However, this model has
a convergence issue with many covariates. To overcome this problem, we ran the modified Poisson regression (i.e., Poisson regression with log link function and robust standard error), which is equivalent to the log-binomial regression (Zou 2004; Tamhane et al. 2016). The final model was adjusted for the child’s age, sex, comorbidity status, maternal education, household wealth index, source of drinking water, type of toilet, shared toilet facility, and place of residence.

As a sensitivity analysis of the primary analysis, we fitted the design-adjusted modified Poisson regression by considering continuous multi-hazard risk score. We adjusted the model for all control variables listed above. Also, we performed a post hoc trend analysis and regression analysis by categorizing the continuous multi-hazard score using quartile. We used the Cochran–Armitage test (Chris et al. 2014; STATA 2020) to assess the trend of undernutrition by the quartile of the multi-hazard score. We fitted the design-adjusted modified Poisson regression to explore the association between childhood undernutrition and the quartile of the multi-hazard score, adjusting for control variables.

We also fitted the generalized estimating equation (GEE) and generalized linear mixed effect model (GLMM) as other sensitivity analyses to account for the natural hierarchy of the data. For example, children are nested under clusters so that children within the same cluster would be correlated. In the GEE, we considered there is an exchangeable correlation among clusters. In the GLMM, multi-hazard is assumed to have fixed effects and cluster (or community) effect as the random effects. Both the GEE and GLMM models were adjusted for the same set of covariates as described above. We reported the prevalence ratio (PR) with 95% confidence interval (95% CI) to assess the relationships. All analyses were conducted in R version 4.0.3.

**Results**

**Background characteristics**

Summary statistics of the analytic sample are presented in Table 1. Of 22,055 children, 28.5% were stunted, 10.1% were wasted, 22.8% were underweighted, and 38.2% had any form of undernutrition (stunting/wasting/underweight). The average age of children was 29.6 months, where the boys-girls ratio was close to 1. The majority of children lived in non-poor households (58.5%) and rural areas (79.1%). The median multi-hazard score was 19.1 (interquartile range: 14.8–22.0). A total of 57.4% of children were from high multi-hazard risk districts.

**Association between multi-hazard risk and childhood undernutrition**

Figure 1 and Supplementary Table S1 show the prevalence of childhood undernutrition by the multi-hazard score. The prevalence of stunting was significantly higher among children from moderate (27.6%) and high-risk (29.3%) multi-hazard districts compared to those from low-risk districts (23.7%). The prevalence of wasting did not significantly vary by district-level hazard risk. Underweight prevalence was significantly higher among children from moderate (22.9%) and high-risk (23.0%) districts compared with low-risk (18.3%) districts. Also, any form of undernutrition was significantly higher among children from moderate (37.0%) and high-risk (39.4%) districts than those from low-risk districts (31.8%). The prevalence of undernutrition among different sociodemographic characteristics is provided in Appendix (Supplementary Table S1).

The regression results of the associations between childhood undernutrition and district-level multi-hazard risk are reported in Table 2. According to the crude analysis, the district-level multi-hazard risk was significantly associated with childhood stunting and underweight but not with wasting. The associations remained statistically significant after adjusting the models for different covariates. In the adjusted analysis, children residing in high multi-hazard risk districts were 19% more likely to be stunted than those from low-risk districts (adjusted prevalence ratio [APR]: 1.19, 95% CI: 1.05–1.36). Also, children from moderate-risk districts were 19% more likely to be
underweight (APR: 1.19, 95% CI: 1.02–1.39), while it was 23% more likely for children living in high-risk districts (APR: 1.23, 95% CI: 1.05–1.43) compared to low-risk districts. However, the prevalence of wasting was only 6% higher among children from high multiple natural disaster risk districts than the low-risk district, and the association was not statistically significant (APR: 1.06,
Table 2. Association between multi-hazard risk and undernutrition among children aged less than 5 years in Bangladesh.

| Goal                        | Unadjusted | Adjusted * |
|-----------------------------|------------|------------|
|                             | PR  | 95% CI     | PR  | 95% CI     |
| Stunting                    |     |            |     |            |
| Multi-hazard risk Low       | 1.00 | 1.00       | 1.00 | 1.00       |
| Moderate                    | 1.17 | 1.02–1.33  | 1.10 | 0.97–1.26  |
| High                        | 1.24 | 1.09–1.42  | 1.19 | 1.05–1.36  |
| Wasting                     |     |            |     |            |
| Multi-hazard risk Low       | 1.00 | 1.00       | 1.00 | 1.00       |
| Moderate                    | 1.01 | 0.82–1.24  | 0.97 | 0.79–1.20  |
| High                        | 1.08 | 0.88–1.34  | 1.06 | 0.86–1.31  |
| Underweight                 |     |            |     |            |
| Multi-hazard risk Low       | 1.00 | 1.00       | 1.00 | 1.00       |
| Moderate                    | 1.25 | 1.07–1.46  | 1.19 | 1.02–1.39  |
| High                        | 1.26 | 1.07–1.47  | 1.23 | 1.05–1.43  |
| Any form of undernutrition  |     |            |     |            |
| Multi-hazard risk Low       | 1.00 | 1.00       | 1.00 | 1.00       |
| Moderate                    | 1.16 | 1.04–1.29  | 1.11 | 1.00–1.24  |
| High                        | 1.24 | 1.11–1.38  | 1.21 | 1.09–1.34  |

PR: prevalence ratio; CI: confidence interval;
*adjusted for child's age, sex, comorbidity (diarrhea episode, acute respiratory infections, or fever) status in the last 2 weeks, maternal education, household wealth index, source of drinking water, type of toilet, shared toilet facility, and place of residence.

95% CI: 0.86–1.31). Overall, the prevalence of any form of undernutrition was 11% higher for children residing in moderate multi-hazard risk districts (APR: 1.11, 95% CI: 1.00–1.24), while it was 21% higher for children living in high-risk districts (APR: 1.21, 95% CI: 1.09–1.34) than low-risk districts.

Sensitivity analyses

The associations between childhood undernutrition and district-level multi-hazard risk score (continuous variable) are presented in Supplementary Table S2. In the adjusted analysis, for one unit increase in district-level multi-hazard score was associated with 1.5% higher prevalence of stunting (APR: 1.015, 95% CI: 1.010–1.020), 1.4% higher prevalence of underweight (APR: 1.014, 95% CI: 1.008–1.020), and 1.4% higher prevalence of any form of undernutrition (APR: 1.014, 95% CI: 1.010–1.019). The result was consistent with the primary analysis.

The results of trend analysis and regression analysis by categorizing the continuous multi-hazard score using quartile are shown in Supplementary Table S3. The findings revealed that the prevalence of childhood stunting and underweight significantly increased with increasing district-level multi-hazard scores. Briefly, the prevalence of stunting, wasting, underweight, and any form of undernutrition was 24.4%, 9.9%, 19.3%, and 33.6% for the first quartile, while it was 30.0%, 10.6%, 23.5%, and 40.3% for the fourth quartile, respectively. According to regression analysis, children from those districts with third and fourth quartiles of multi-hazard risk were more likely to be stunted, underweight, and any forms of undernutrition compared to the first quartile. However, wasting was not associated with multi-hazard risk. This result was also consistent with the primary analysis.

The results using GEE and GLMM are shown in Supplementary Table S4. We observed approximately similar results as the primary analysis.
**Discussion**

In the present study, we observed a significant association between district-level multi-hazard risk and undernutrition among under-5 children in Bangladesh. Children from high multi-hazard risk districts were 19% more likely to be stunted, 23% more likely to be underweight compared to low-risk districts. These associations remained significant in the sensitivity analyses using continuous and quartile of the multi-hazard score, and hierarchical models. However, childhood wasting was not significantly associated with district-level multi-hazard risk. These findings indicate that multi-hazard risk has a role in undernutrition among under-5 children in Bangladesh, but the burden was not pronounced for childhood wasting.

Negative effects of natural hazards on the nutritional status of children have been reported previously and support the results of the present study. Studies conducted in Bangladesh (Del Ninno et al. 2003), India (Rodriguez-Llanes et al. 2011, 2016), and Nepal (Gaire et al. 2016) reported that children from flooded-area are more likely to be malnourished. Moreover, studies conducted in Nepal (Webb et al. 2015), Pakistan (Hamid et al. 2008), and Colombia (Bustelo et al. 2012) found that earthquake is inversely associated with childhood stunting and wasting. Childhood health and nutrition is also adversely affected by cyclone and tornado (WHO 2000; Pradhan et al. 2016), though some studies reported some indirect relationships (Rah et al. 2011; Rodriguez-Llanes et al. 2011; Grecu 2013; Smith et al. 2013). However, the link between district-level multi-hazard risk and child nutrition status is still largely unexplored, and thus, the underlying mechanisms for effects have not been completely understood. This study makes novel contributions to assess the nutritional status of children living in disaster-prone districts.

This study did not find any significant association between childhood wasting and district-level multi-hazard risk. Earlier studies on childhood wasting in relation to different specific natural hazards also provided inconsistent results. For example, a study based in India reported that wasting did not vary significantly between children living in flooded areas and non-flooded areas (Rodriguez-Llanes et al. 2011). However, another study conducted in India reported a significant positive association between wasting and flooding (Rodriguez-Llanes et al. 2016). Another study in Nepal found that the prevalence of wasting was lower among children living in temporary shelters due to earthquakes (Dhoubhadel et al. 2020). Our statistically insignificant result can be explained by the nature of wasting variable (acute malnutrition), which is likely caused by short-term nutritional stress. But the lack of a substantial difference in short-term nutritional stress between children living in disaster-prone areas and children living in less disaster-prone areas may be attributed to the fact that different government and non-governmental organizations were quickly mobilized and provided supplies following major disasters struck (Rodriguez-Llanes et al. 2011). A study in Nepal reported that the prevalence of underweight and stunting increased among children living in temporary shelters due to earthquakes, while the prevalence of wasting decreased (Dhoubhadel et al. 2020). That indicates that the long-term effects of natural disasters on children’s nutritional status are likely to be more severe than the short-term nutritional impacts in South East Asian countries. During disasters, emergency responses can help control acute malnutrition (wasting) in the short term, but chronic malnutrition (e.g., stunting) necessitates long-term strategies due to its adverse effects on child health and wellbeing. Furthermore, in Bangladesh, stunting is more common than wasting, and climate change or catastrophe may intensify the problem in the future. As a result, measures such as reconstruction and resource allocation, including improved shelters, markets, health facilities, crop or food storage, improved sanitation, and emergency medicine, focusing on all forms of malnutrition, are needed. This study warrants further research to comprehend the complex dynamics of child malnutrition and natural disasters in Bangladesh.

The poor nutritional status of childhood in disaster-prone areas could be due to the impact of disasters on agriculture and food security. Agriculture is one of the sectors that gets most affected by various natural hazards (FAO 2015). However, adaptive measures against a single disaster might be effective, but agricultural adaptation to multi-hazard is challenging to design and execute (FAO 2017).
Thus, difficulty in agricultural adaptation, higher loss, and damage of agricultural products jeopardize food availability, one of the three core dimensions of food security (Gross et al. 2000). Natural hazards also result in economic impacts in the form of income reduction and poverty (Kamal et al. 2018), which leads to the reduced purchasing power of the households and therefore disrupting their accessibility to food items. Furthermore, the adverse situation following a disaster can affect the utilization dimension of food security by forcing people to compromise with diet quality. Therefore, all three core dimensions of food security are affected by disasters (Gross et al. 2000). In disaster-prone areas, this food insecurity can lead to children’s weight and height loss and cause a prolonged nutritional crisis.

In addition, a greater multi-hazard risk also reflects several hazards that have occurred in that particular region over generations (Kappes et al. 2012). Consequently, a vicious circle starts from birth (e.g., low birth weight, anemia), continues through infancy (stunted, wasted or underweight children), adolescence, and culminates in undernourished women of reproductive age giving birth to undernourished children. Research has reported that early marriage can be triggered by prolonged exposure to natural disasters (McLeod et al. 2019), contributing to early and close-spaced pregnancies (De Groot et al. 2018), adverse pregnancy and birth outcomes, malnutrition and iron deficiency (Goli et al. 2015), and thus, adversely affecting the nutritional status of children. Moreover, children living in disaster-prone areas are more likely to be exposed to natural disasters. Natural disaster exposure increases the likelihood of acute illnesses such as diarrhea, fever, and acute respiratory illness in young children that are associated with childhood undernutrition (Datar et al. 2013). Furthermore, the health system in disaster-prone areas is overburdened and more fragile compared to other areas. Disasters often interrupt health services, leaving impacted people without access to healthcare in times of emergency (Swathi et al. 2017). These result in comparatively poor utilization of maternal and child care services (Baten et al. 2020), further increasing the risk of childhood undernutrition.

In a nutshell, residing in multi-hazard risk areas can exacerbate many of the immediate, underlying, and primary factors associated with child undernutrition. This issue warrants applying a multi-hazard-based disaster risk reduction approach to block the multiple pathways through which disasters affect child undernutrition. In recent years, remarkable progress has been made in disaster management in Bangladesh (Ahmed et al. 2015). However, the multi-hazard concept that is important to aid and orient the authorities’ decisions regarding hazard mitigation and preparedness has not been extensively used (Mahendra et al. 2011). In fact, nutritional interventions seldom consider disaster contexts while designing and executing the project, let alone adopting a multi-hazard approach. Instead, interventions usually follow a blanket approach without considering the vulnerability of the project components to natural hazards (Pritchard et al. 2018). Hence, all the future nutritional interventions, especially those targeting childhood undernutrition, could be designed considering the vulnerability of the targeted population to multi-hazard. Tailor-made solutions considering each pathway might be more effective to address the childhood undernutrition challenge. Particular attention should be given to safeguard agriculture and food security, redesigned health system, maternal nutrition, and utilization of health care services in moderate and high-risk multi-hazard areas. Bangladesh has included strategies to ensure adequate nutrition for vulnerable people in disaster-prone areas in its national nutrition policy. Still, strategies mainly focus on addressing food insecurity in emergencies and meeting the basic nutritional needs of vulnerable populations after disasters (Government of People’s Republic of Bangladesh 2015). Thus, it lacks long-term strategies to combat childhood undernutrition by considering the risk and challenges of chronic exposure to multi-hazard. The existing framework for disaster risk reduction also does not include reducing childhood undernutrition as an integral part of the action plan. Hence, it is essential to reduce child undernutrition central to resilience in all disaster management initiatives in areas prone to multi-hazard through coordinated national plans.

This study has several strengths, including analysis of recent large national representative data. This study also made a novel contribution to assess the association between district-level multi-
hazard risk and childhood undernutrition in Bangladesh. Moreover, we used comprehensive statistical methods and adjusted the models for a set of potential covariates.

Despite its strengths, the present study has some limitations. First, this study analyzed cross-sectional data, which precludes the assessment of temporal relationships. Second, the multi-hazard score was calculated based on only four disasters, such as tornados, cyclones, earthquakes, and floods. Therefore, other disasters such as river/coastal erosion, landslides, salinity, tidal surge, and drought were missing. However, tornados, cyclones, earthquakes, and floods are considered as the major hazards in Bangladesh, and the authors (Barua et al. 2016) followed a rigorous technique to construct the hazard index by considering historical data, intensity scales, and damage risk levels of these hazards. Third, the multi-hazard score was an area-level environmental feature, which does not ensure the individuals’ exposure to natural disasters. Fourth, possible factors such as maternal body mass index, health service access, food practice factors were not available for all children in this survey data.

**Conclusion**

Our findings indicate that residing in multi-hazard risk districts is significantly associated with higher prevalence of stunting and underweight but not wasting. Global climate change is likely to increase the frequency and intensity of disasters that will further worsen this situation, especially in Bangladesh, where farming is very popular. Strategies such as agricultural adaptation and coping mechanisms, aimed at achieving food security, long-term post-disaster nutritional response, a more extended period of relief supports, and enhanced quality maternal and child care services, particularly in moderate and high-risk multi-hazard risk districts, may help to reduce childhood nutritional burden in Bangladesh. The national action plan should incorporate all disaster management initiatives to tackle the burden of child undernutrition. Furthermore, the systematic generation of evidence from long-term and high-quality household-level data is crucial to quantifying the hazard-attributable fraction of undernutrition and planning strategies.

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**Disclosure of potential conflicts of interest**

The authors declare that there is no conflict of interest.

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**Ethical standards disclosure**

MICS data are public access data and made available upon request. Informed consent was obtained from the respondents before the interviews. Also, ethical clearance to conduct the MICS was approved by the Government of Bangladesh.
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