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Estimating the relationship between extreme climate events and early female marriage in Bangladesh

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UNICEF defines child marriage as any formal marriage or informal union between a child under the age of 18 and an adult or another child

Climate change and socio-economic insecurity are major child marriage factors

Tribune Desk Published a

Bangladesh has one of the highest child marriage rates in the world Syed
Tribune

Climate change is pushing more young people into child marriages and labour in Bangladesh

A report has found a link between environmental disasters and the futures of more than 19 million young people that live in the country

Agence France-Presse | April 10, 2019

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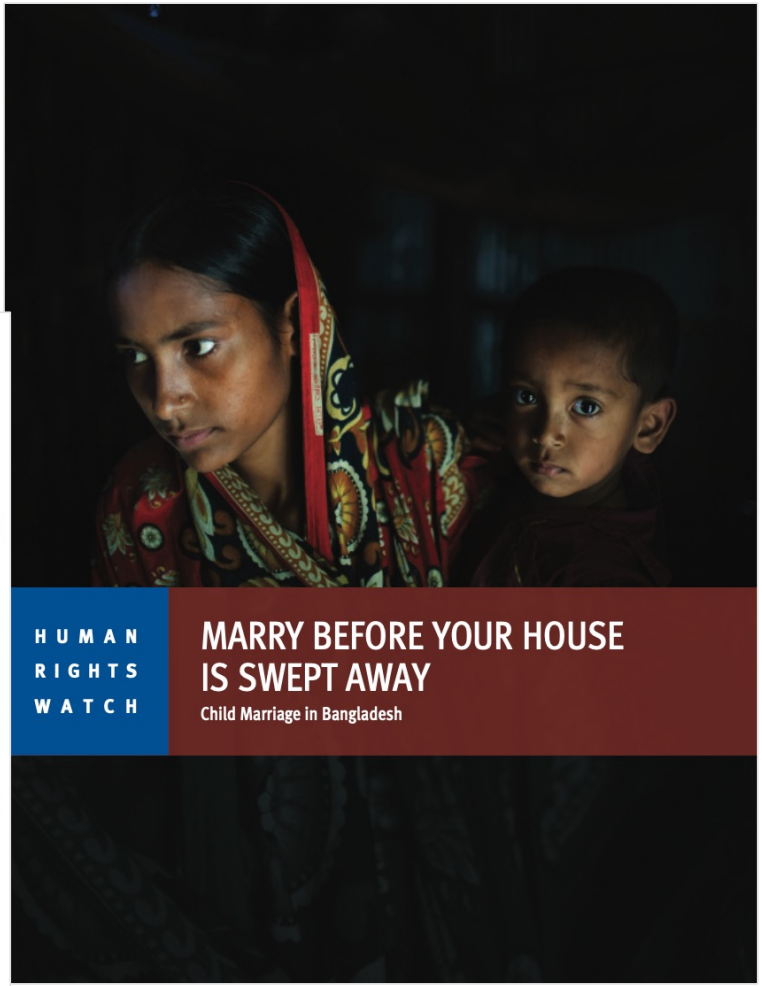
Climate change is pushing poorer Bangladeshis to head to big cities.
Photos: AP



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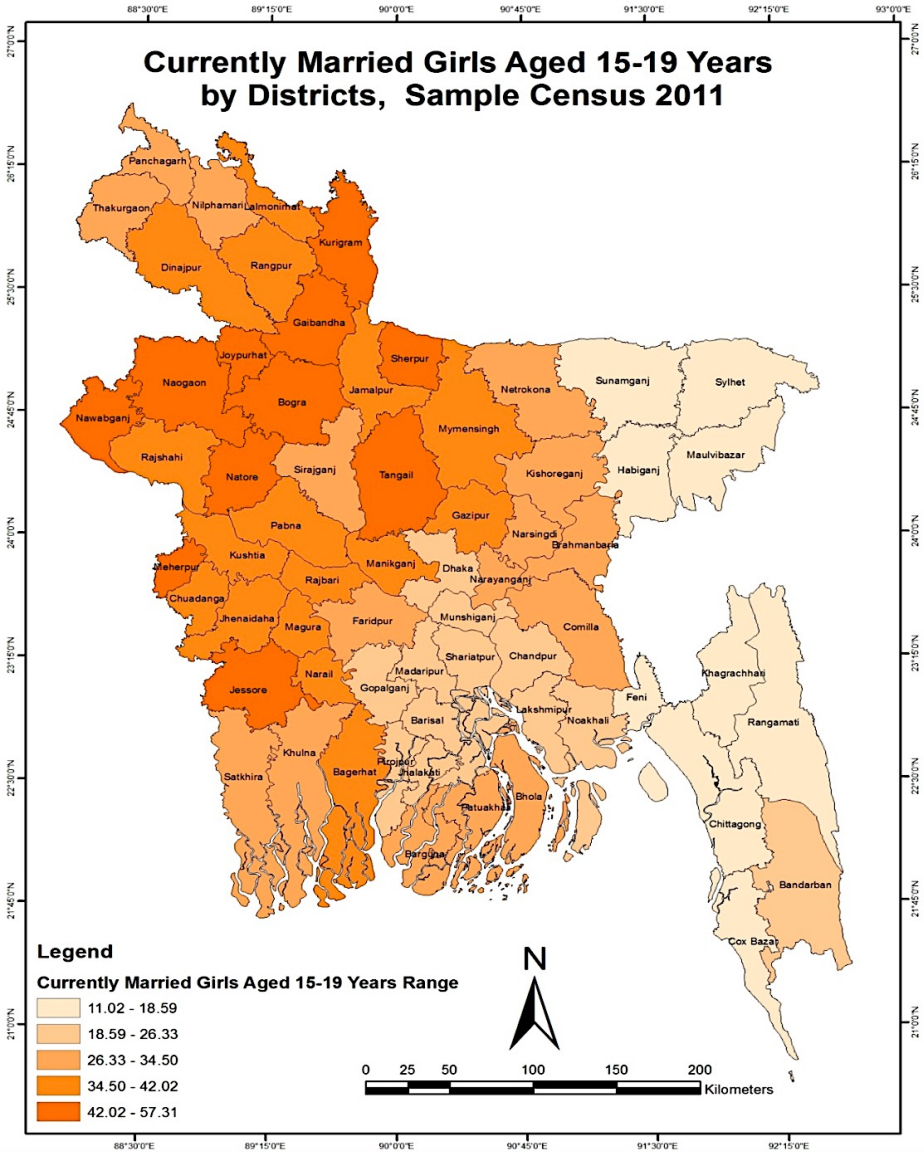
Context of the study /1

Bangladesh

- Among the countries with the highest rates of child marriage worldwide (Barkat & Majid 2003) and the highest rate of marriage involving girls under 15 (UNICEF 2014)
- Mean age at marriage today is 16 (and increasing over time)
  - 2 in 3 women married before turning 18
  - 1 in 4 women married before turning 15
- The risk of experiencing early marriage is influenced by women's SE conditions (poverty, low literacy, rural or slum settings, ethnicity, religion)
- The percentage of married girls 15-19 varies across the country

Figure 1 Percentage of married girls aged 15-19 by district (census data)



Source: Bangladesh Bureau of Statistics (BBS), Statistics and Informatics Division (SID), Ministry of Planning, Govt. of Bangladesh

Context of the study /2

Bangladesh

- It is the sixth most natural disaster-prone country in the world (World Risk Report 2015)
- Vulnerability to different meteorological, hydrological, and geological hazards

Under the pressure of climate change:

- More frequent floodings (1 every 5 years in the last 20 years, vs 1 every 20 years before)
- More intense and frequent cyclones
- Part of the country is increasingly drought-prone during the dry season

"Almost every climate change impact you can think of, some place in Bangladesh is going to be feeling it"

Dr. Saleemul Huq, Director at the International Center for Climate Change and Development, Dhaka

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Background and rationale

Link between climate extremes and child marriage in Bangladesh

- Well documented in the qualitative (e.g. Ahmed et al. 2019, Alston et al. 2014) and grey literature (NGOs, local institutions), as well as in journalistic reporting
- Child marriage as a suboptimal coping strategy:
  - Reduction of costs related to daughters' upkeep after sudden impoverishment
  - Dowry optimization
  - "Protection" of girls from the risk of sexual violence in case of internal displacement or relocation to disaster shelters
- More difficult to assess using quantitative data (Asadullah et al. 2020, Carrico et al. 2020, Tsaneva 2020)
  - Point at a positive association between climate extremes and transition to marriage
  - Generally rely on primary data collected at village/municipality level in specific areas
  - Focus on dry spells (duration) and heat waves (intensity): temperature and precipitation data

Research questions

1. ***Is there a positive relationship between climate extremes and the transition to marriage in Bangladesh?***

2. ***Do climate extremes push toward a faster transition to marriage – i.e., before turning 18 years old?***

Methodology /1

Data

For marriages and other individual characteristics:

- **Bangladesh Demographic and Health Survey** (BDHS), pooled sample (years 1999/00, 2004, 2007, 2011, 2014, 2017/18)
- **N ≈ 42 thousand ever-married women aged 15-49** (marriages occurred between 1990 and 2016) who either never migrated or moved to the place where they were interviewed before entering the marriage, to ensure robustness to internal migration

For climate variability:

- **Standardized Precipitation Evapotranspiration Index** (SPEI) (Vicente-Serrano et al. 2010)
    - A measure of drought severity according to both its intensity and duration based on the cumulated difference between precipitation and potential evapotranspiration due to temperature, allowing to capture both dry and wet climate anomalies
    - Widely used in environmental and population science (e.g. Gansch et al. 2021, Muttarak & Dimitrova 2019)
    - We use SPEI time series between 1990 and 2016 retrieved from Aadhar & Mishra (2017a, 2017b)

Methodology /2

Data

- SPEI is calculated over time periods ranging from 1 to 48 months. Different time scales are useful for monitoring drought conditions in different hydrological sub-systems
  - *Shortest time scales (1-12)*: the drought series show a high frequency of drought, and moist periods of short duration → shorter time scales are mainly related to soil water content and river discharge in headwater areas
  - *Medium time scales (12-24)* are related to reservoir storages and discharge in the medium course of the rivers
  - *Longest time scales (24-48)*: the drought periods are of longer duration and lower frequency → long time scales are related to variations in groundwater storage
- The SPEI is usually categorized into severity classes (0 being the "near normality" for the period in question), while positive and negative values distinguish between wet and dry situations

Categories	SPEI Values
Extreme drought	Less than −2.00
Severe drought	−1.99 to −1.50
Moderate drought	−1.49 to −1.00
Near normal	−0.99 to 0.99
Moderately wet	1.00 to 1.49
Severely wet	1.50 to 1.99
Extremely wet	More than 2.00

Table 1
SPEI categories

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Methodology /3

Method

Multilevel discrete-time Survival Analysis logistic modelling

- Two sets of models
  - Transition to marriage at any age (**Model 1**)
  - Transition to early marriage (i.e. before turning 18) (**Model 2**)

  } TIME AT RISK BEGINS AT AGE 10
- Random intercept at the district level to consider observations as *nested* into districts (N = 64) to control for similar cultural/economic/environmental features shared by women from the same district
- Time-invariant covariates:
  - Individual level: birth cohort, religion, husband's educational level, lives in a rural/urban area
- Time-variant covariates:
  - Individual level: school attendance
  - District level: SPEI over selected time periods (12, 24, 36, and 48 months before getting married), percentage of severely underweight children

Results /1

Table 2 Multilevel discrete-time survival logit estimates
(odds ratio and significance levels)

Model 1	Transition to marriage (any age)			
Ref. category: Near normal	SPEI12	SPEI24	SPEI36	SPEI48
Extremely wet	1.076	1.595***	1.711***	1.549***
Very wet	0.997	1.052*	1.130***	1.164***
Moderately wet	1.021	0.958*	1.024	1.071***
Moderate drought	1.070***	1.013	1.140***	1.180***
Severe drought	0.901**	1.054	1.083**	1.210***
Extreme drought	0.880	0.823***	1.442***	0.756***

Model 2	Transition to early marriage (<18 yrs old)			
Ref. category: Near normal	SPEI12	SPEI24	SPEI36	SPEI48
Extremely wet	1.020	1.308***	1.364***	1.241**
Very wet	0.973	1.032	1.089**	1.120***
Moderately wet	1.002	0.947**	1.013	1.030
Moderate drought	1.074***	0.974	1.099***	1.149***
Severe drought	0.911**	1.097**	1.113***	1.167***
Extreme drought	0.996	0.835**	1.344***	0.804**

Notes: Significance at *** p<0.001, ** p<0.005, and * p<0.05. Estimates are robust to internal mobility.
Controls for years at risk, religion, husband's educational level, lives in a rural/urban area, birth cohort, percentage of severely underweight children, school attendance are applied. No. of person-year observations ≈ 361/ 320 thousand. No. of groups = 64.

Results /1

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Results /2

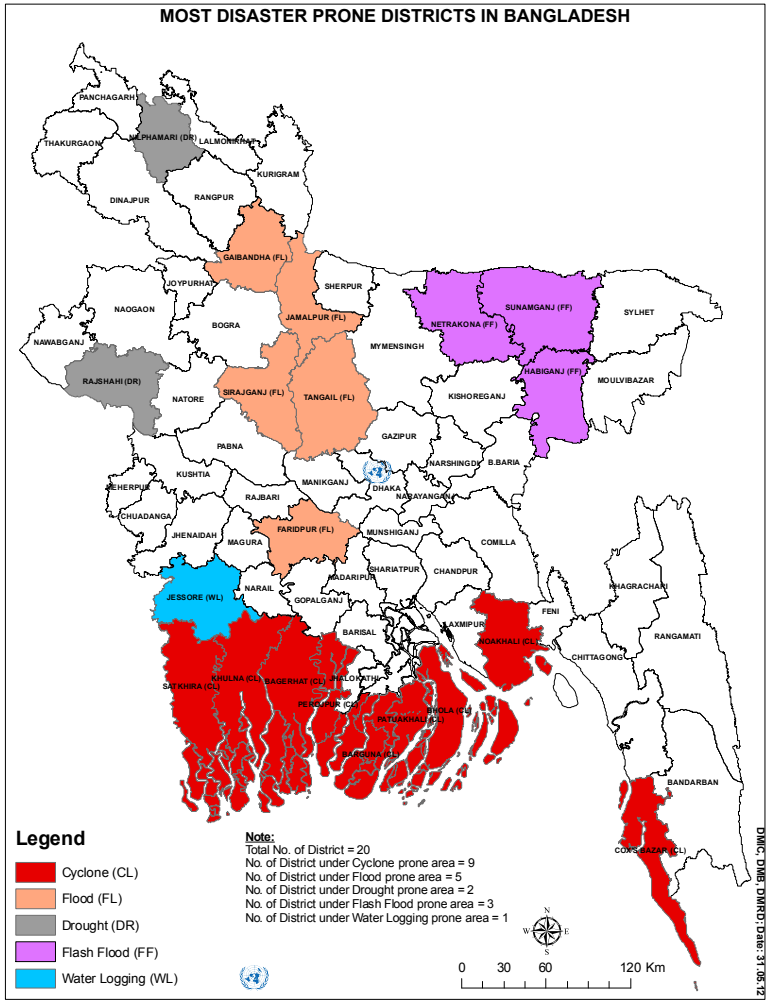
Table 3 Higher risk of marriage **at any age** by type of risk area (SPEI36, ref. category: “Near normal”)

	Cyclone	Flood	Drought	Flash Flood	Water logging	Least disaster prone
Extremely wet	***			***		***
Very wet				*		**
Moderately wet						
Moderate drought			*	***		***
Severe drought		**	**			***
Extreme drought				***		***

Table 4 Higher risk of marriage **< 18yo** by type of risk area (SPEI36, ref. category: “Near normal”)

	Cyclone	Flood	Drought	Flash Flood	Water logging	Least disaster prone
Extremely wet	*			***		**
Very wet						
Moderately wet						
Moderate drought				**		***
Severe drought						***
Extreme drought				**		**

Figure 2 Most disaster-prone districts in Bangladesh (Govt. of Bangladesh, 2012)



Conclusions

- Measuring the effects of climate extremes on the transition to marriage in contexts where early marriage is a social norm is not easy (both culture and the economy offer incentives)
- Our findings confirm that, overall, in Bangladesh prolonged climate extremes accelerate the transition to marriage at any age and before the age of 18
- Using the SPEI computed over 12, 24, 36 and 48 months, we find that transition to marriage responds to *permanent* climate changes rather than to short-term and abrupt variations
- The risk of entering marriage earlier is triggered by different kinds of climate extremes across the country
    - Least disaster-prone districts seem to suffer from different kinds of vulnerability: greater heterogeneity due to the larger sample size, but not to disregard
    - Households living in disaster-prone areas may have an array of coping strategies to turn to other than early marriage: possible policy implications?

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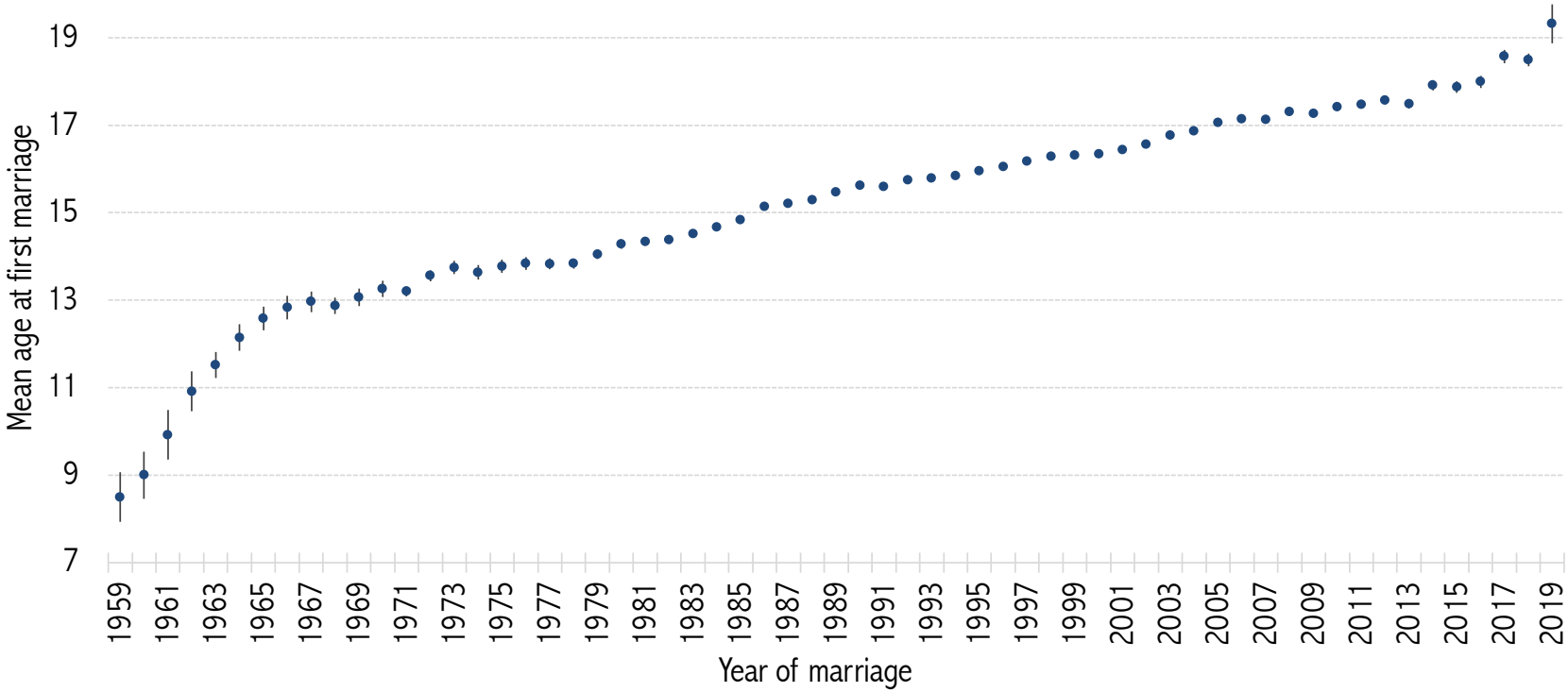
Figure 2

Mean age at first marriage for women and girls of 62 birth cohorts by year of marriage (BDHS/MICS Bangladesh, pooled data 1996-2019)



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