Spatial analysis for understanding contextual factors of variation in early marriage trends in Bangladesh

Secondary Analysis of the BMMS 2010

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Objectives:

- Understand the main demographic predictors for ‘age at marriage’ using the 2010 BMMS
- To explore the presence of ‘regimes’ in marriage patterns in relation to age at marriage
- Assess differences in predictors between regimes
- Explore regional differences

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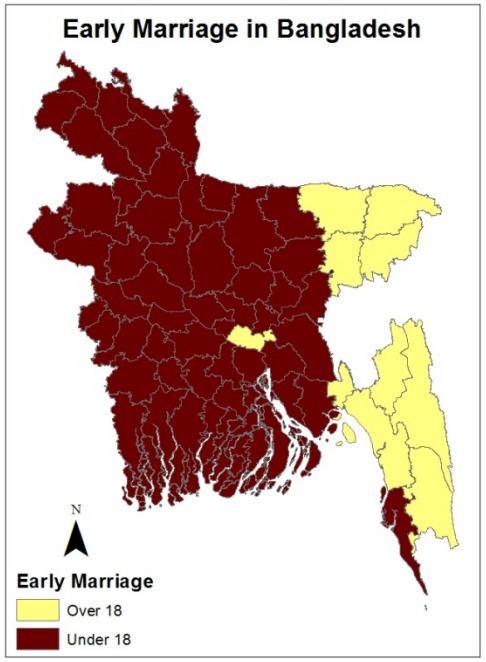
Early Marriage in Bangladesh

- Third highest in the world after Niger and Chad
- Median age at marriage was 16.6 years (2011 BDHS) among age group 20-24
- Due to cultural norms, a woman with more education will have a higher dowry & a woman who is older will have a higher dowry
- Both poor and wealthy families have motivations to marry daughters at an early age
- One-third of all births in the country are to teenage mothers
- Age at first marriage has remained relatively unchanged despite massive investments in female education
- Early marriage can adversely affect health outcomes as well as educational and economic opportunities
- Early marriage often leads to adolescent child-bearing which can adversely affect health for mothers and their offspring



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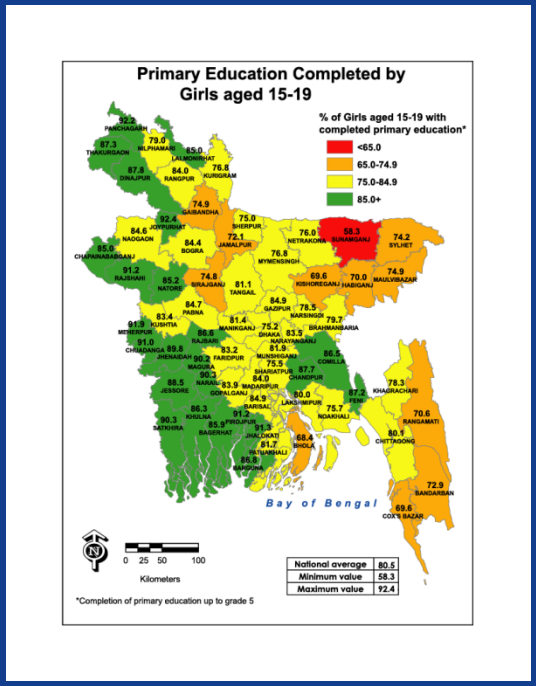
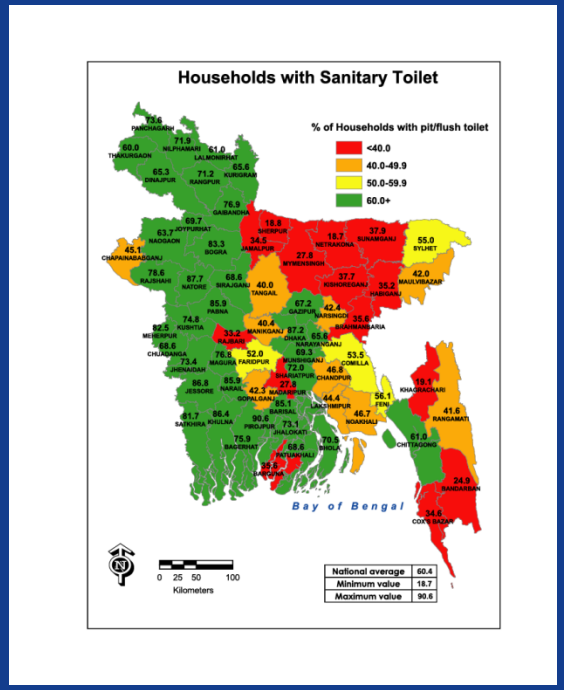
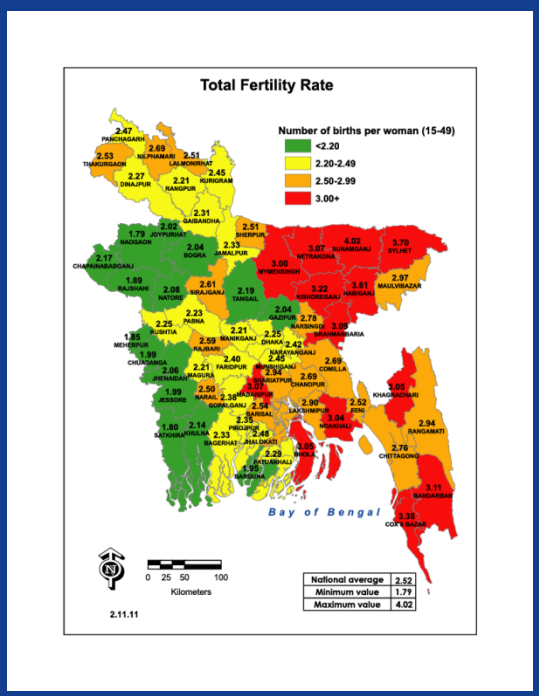
Motivations:

Question: Are there regional variations in age at marriage predictors and health outcomes across Bangladesh?







While we know that early marriage often leads to poorer health outcomes, we don't necessarily see that in Bangladesh

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BMMS 2010

- Bangladesh Maternal Mortality and Health Care Survey 2010
  - Multi-partner project to serve programmatic and information needs of the government of Bangladesh.
  - Main objectives to:
    - Provide a national estimate of maternal mortality ratio (MMR) for the period of 2007-2010
    - To identify the causes of maternal and non-maternal deaths among adult women
    - To determine whether MMR had declined significantly from the level estimated for the period 1998-2001 in BMMS 2001.
  - Funded by the government of Bangladesh, USAID, AUSAID, and UNFPA
  - Nationally-representative sample of 175,000 households conducted from January to August 2010.
    - Ever-married women aged 13-49 in selected households.
    - Response rate of over 97%.
    - Employed 5 questionnaires: Household questionnaire, women's short questionnaire, women's long questionnaire, verbal autopsy questionnaire and a community skilled birth attendants' questionnaire.

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Methods: Marriage Proxy

- Problem: No ‘age at marriage’ variable included in BMMS 2010.
- Solution: Created a proxy indicator utilizing BDHS 2011
- Steps: Split women into 3 mutually exclusive categories and looked at their averages by district and if possible disaggregated by urban/rural residence and 7 age groups

  - *Women who had given birth*
  - *Women who were pregnant with their first birth*
  - *Women who had never given birth and were not currently pregnant*
  - *Women under the age of 15 (excluded)*

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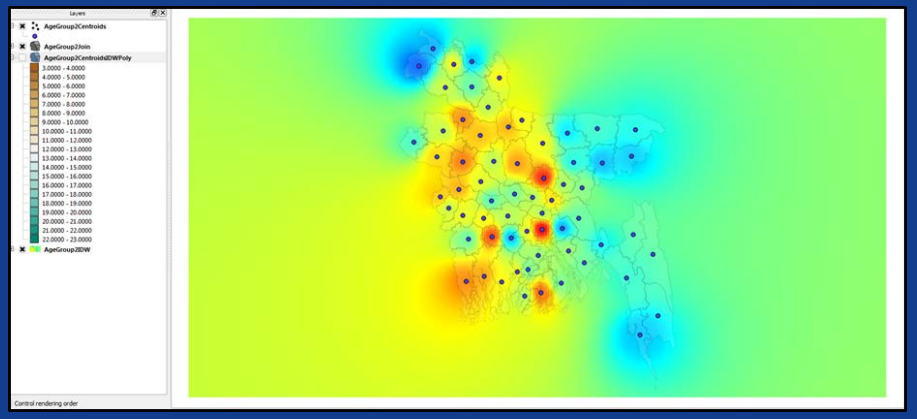
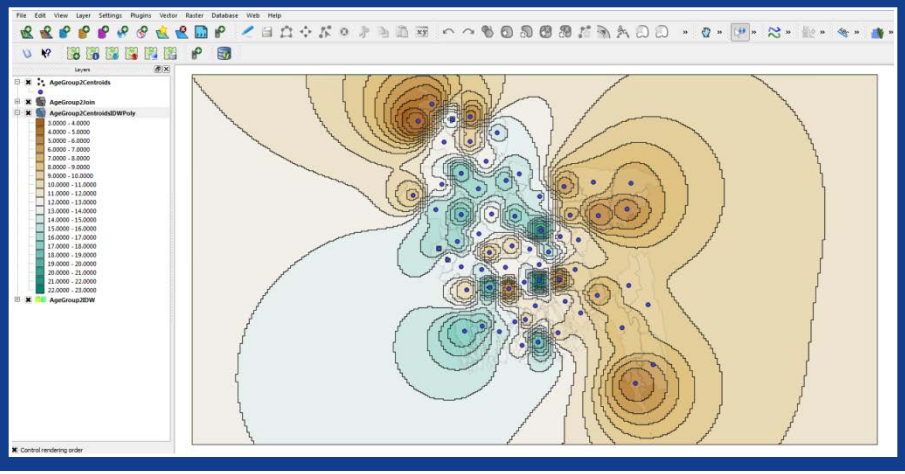
Methods: Marriage Proxy Interpolations

- *Districts with very small sample:*
  - Missing values due to small samples.
  - Mapped centroids for each district with known values
  - Used IDW to obtain estimates for missing districts..





Methods: Variables

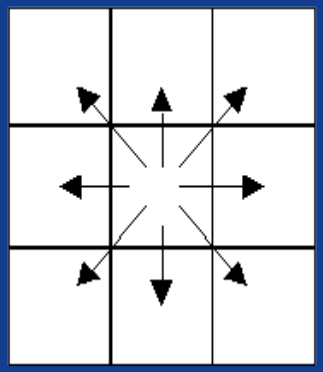
- Limited demographic variables in the long-form questionnaire
  - Age at marriage: created by proxy, expressed in months (continuous dependent variable)
  - Wealth: Wealth quintile derived from household assets using PCA in BMMS
  - Education: Educational attainment in years
  - Islam: Proportion of district who have identified their religion as Islam (ref. Non-Islam)

Methods: Regressions

- Step 1: OLS with spatial weights

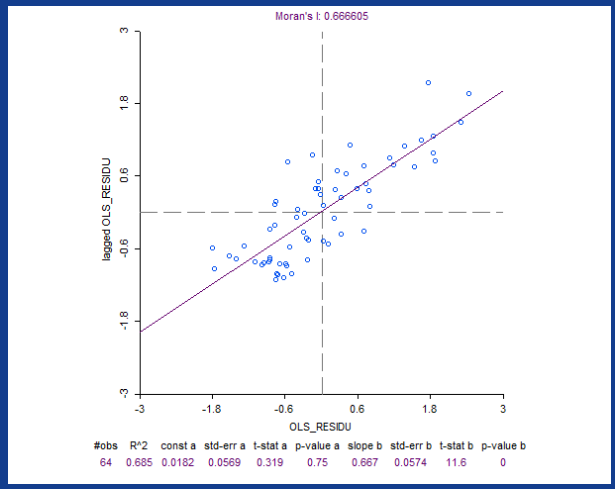
  (queen contiguity)

  - Adjusted R2: 0.433053
  - Significant predictors: Wealth*** and Islam***



OLS Residuals: Significant spatial autocorrelation. →

Spatial Lag and Spatial Error models both significant



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Methods: Regressions

- Step 1: Spatial Lag Model – MLE
  - R2: 0.835407
  - Log Likelihood: -176.115
  - AIC: 362.024

Constant: 52.4562***

Islam: -0.1762309***

Wealth: 3.886426 *

Education: -0.3583039

W_AgeAtMarriage: 0.7719911***

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Methods: Regressions

- Step 1: Spatial Error Model – MLE (Best Fit)
  - R2: 0.862014
  - Log Likelihood: -173.666750
  - AIC: 355.333
  - Bruesch-Pagan Test: p=0.1111543 (absence of heteroskedasticity)

Constant: 211.9501***

Islam: -0.2480397***

Wealth: 3.285153 *

Education: 1.196239

Lambda: 0.8828456 ***

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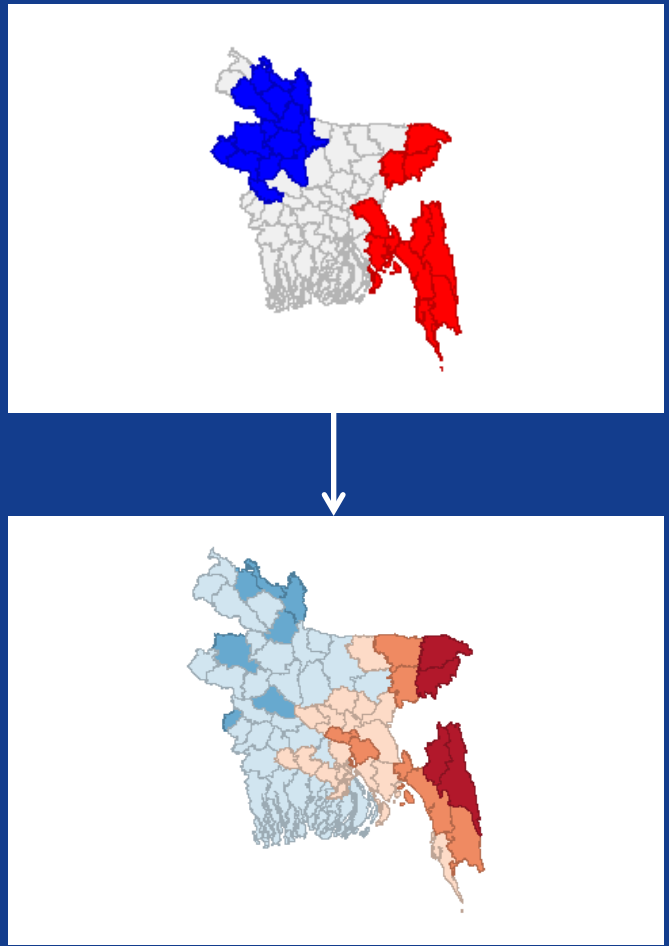
Methods: Spatial Regimes

- Age at marriage is highly spatially auto correlated as evidenced by the Moran's I: 0.743905*** and has significant high and low clusters using LISA statistics
- We decided to test for spatial regimes to assess if our models would be different
  - Red values: East
  - Blue values: West



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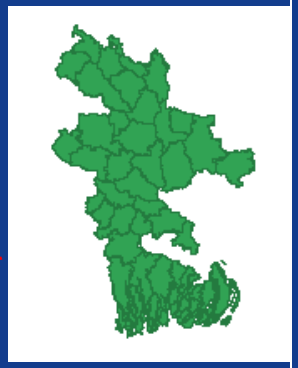
Methods: Spatial Regimes

- We included a ‘regime’ binary indicator in our original OLS models to test whether it was significant.
- We developed models for ‘East’ and ‘West’ regimes.
- Developed MLE best fit spatial models
- Chow Test: 132.894 – Reject null hypothesis of structural stability; regimes are different

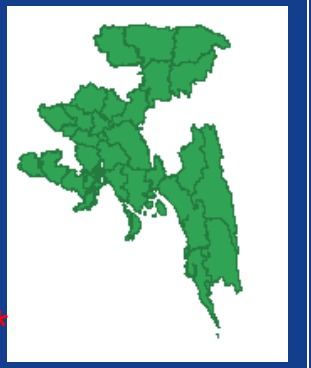
West:

Constant: 193.0049***
Islam: -0.06957622
Wealth: 0.130359
Education: 3.043737***
Lambda: 0.5597435***



East:

Constant: 221.0703***
Islam: -0.2190919***
Wealth: 4.837868**
Education: -1.101538
Lambda: 0.7001517***



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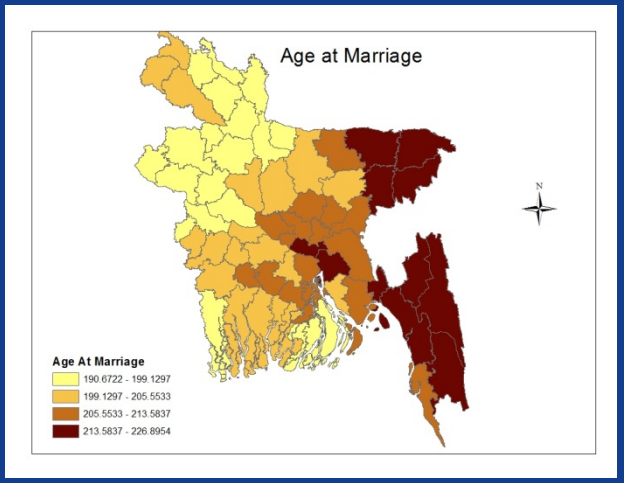
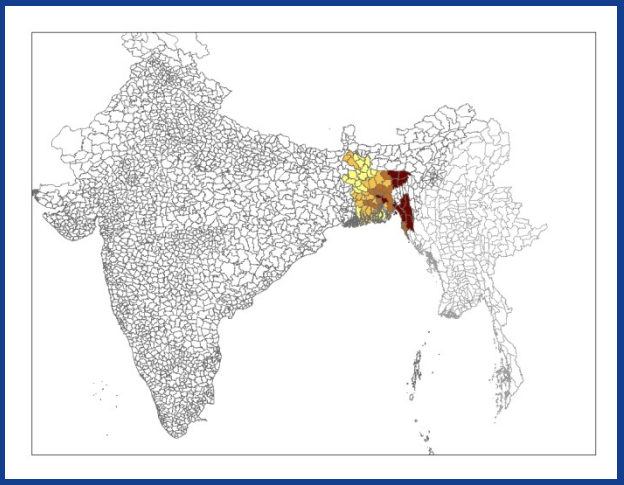
Results

Education emerged as significant predictor of age at marriage in West. If diffusion is happening from West Bengal, women are continuing with schooling after marriage. Demographics in the west of BD are similar to that of West Bengal rather than to Bangladeshi national statistics (Kamal 2009).

East has poor health outcomes despite having a higher average age at marriage and this is plausibly explained by higher religiosity in the region whereby women practice purdah (female seclusion) thus explaining the lower education and contraceptive use rates in the eastern districts. Tribal groups in BD tend to have higher age at marriage. Wealth is a also a significant factor in explaining timing of marriage in the East – here, wealthier girls get married later.

Preliminary Conclusion: The observed anomalies in the east and west regimes are largely explained by the unique ethnic composition and social/political/religious histories of these districts bordering with North-eastern states of India and with West Bengal, respectively .





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Limitations

- Limited demographic variables in the long-form questionnaire
- Needed to create a proxy for age at marriage
- Can only do district-level analysis, where lower level analysis might yield more interesting and revealing results and trends
- Access to data
- Only preliminary analysis
- Ecological Fallacy:

  Differences between OLS at women level

  Limited aggregation levels

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Next Steps

- Investigate the short-form questionnaire to mine for more predictors (ie. Education attainment of husband etc..)
- Better understand how the significant predictor variables influence age at marriage and health outcomes in the East and West of the country
- Investigate other ways to create proxy including SME.
- Compare to MICS
- Conduct GWR and logistic regression on ‘early marriage’ as binary indicator for comparison.
- Further investigate ‘regimes’ and test different regimes
- Investigate how health outcomes vary across the ‘global’ and ‘local’ models.

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