

*fraym*

**Analyzing Girl Child Marriage: Cross-Country  
Synthesis**

**Prepared for the Child Marriage Learning  
Partners Consortium**

**With Support from the Bill & Melinda Gates Foundation**

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# Report Overview



## REPORT OVERVIEW || ANALYTIC FRAMEWORK

Fraym produced hyperlocal visualizations of child marriage prevalence and burden, community contexts, and associated risk factors across six focus countries.

1

This report outlines the **cross-country learnings** on girl child marriage from the detailed reports for **Bangladesh, Ethiopia, India, Kenya, Malawi, and Senegal**, as part of the Child Marriage Learning Partners Consortium.<sup>1</sup> These focus countries are not necessarily representative of global and regional child marriage patterns, but rather the countries that learning consortium partners have prioritized due to a range of research, advocacy, and programmatic factors.

2

Fraym **mapped the prevalence and burden of under-18 and under-15 girl child marriage and analyzed spatiotemporal trends across a ten-year time period**, where possible. This was conducted at the national, subnational, and community level (1km<sup>2</sup>) for each of the focus countries.

3

Additionally, Fraym assessed a variety of indicators that help to **illuminate community contexts and their relationship with child marriage prevalence**. Target community-level indicators include those that are more traditionally associated with child marriage, such as education, as well as less explored factors, such as access to electricity or improved sanitation at home.

4

Fraym **developed three profiles that capture potential risk factors of child marriage based on a summary of available evidence and expert consultation**: (i) pregnancy before marriage; (ii) poverty; and (iii) gender-equitable attitudes and behaviors. Fraym then mapped these profiles to identify potentially high-risk communities and to estimate the number of potentially at-risk girls (ages 10 to 14).

5

The following report presents **high level findings from across the three areas**: mapping of prevalence and burden, community context, and risk factor profiles.

**Note 1:** For India, prevalence and burden is mapped at the national level, while the remaining sections of the report focus on Bihar and Uttar Pradesh. Nigeria is excluded from the cross-country synthesis, as it was not one of the countries considered by other learning consortium partners. Members of the Bill & Melinda Gates Foundation funded consortium include Fraym, Iris Group, Girls Not Brides, Population Council, Center on Gender Equity and Health, UNICEF, and Unchained at Last.

# Mapping Prevalence and Burden



## MAPPING PREVALENCE AND BURDEN || METHODOLOGICAL APPROACH

Fraym mapped the prevalence and burden of under-18 and under-15 child marriage and analyzed spatiotemporal trends across the three most recent geotagged surveys.

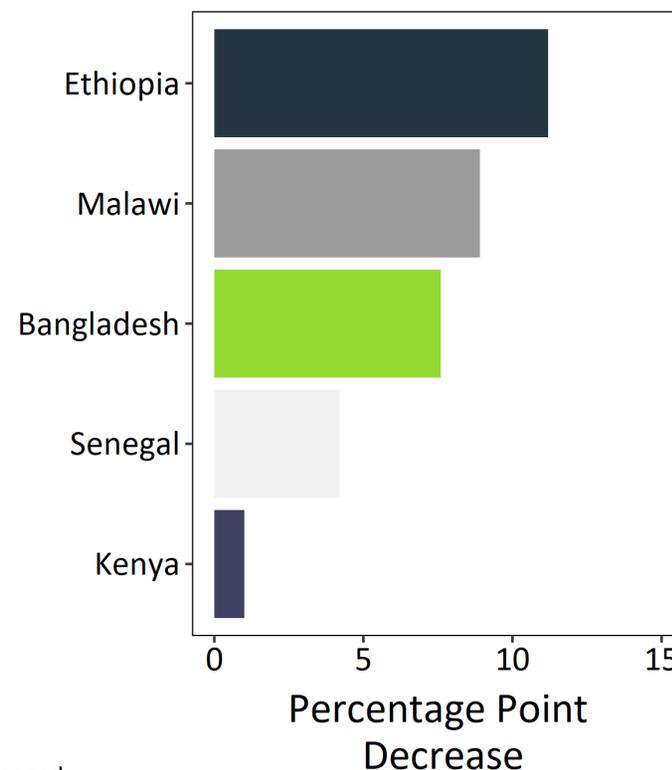
- 1 Fraym's analysis **focused primarily on the cohort of women aged 20 to 24**. Under-18 and under-15 child marriage prevalence is defined as the percent of women aged 20 to 24 at the time of survey enumeration who were married before age 18 and age 15, respectively.<sup>1</sup> Burden is the number of women who were married before age 18 and 15.
- 2 Using the most recently available geo-tagged household survey, **Fraym mapped under-18 and under-15 child marriage prevalence and burden at the national, sub-national, and community levels (1km<sup>2</sup>)**.
- 3 Finally, Fraym examined two previous survey intervals in order to **assess spatiotemporal trends across the full time period, as well as the in-between intervals**.

## MAPPING PREVALENCE AND BURDEN || SUMMARY FINDINGS

Countries fall into two general categories: (1) largely unchanged *national* prevalence rates but significant *sub-national* variation over time; and 2) significant national level decreases that were also widespread at the sub-national level.<sup>1</sup>

- 1 In Kenya and Senegal, national prevalence rates decreased slightly over time, but there were **significant community-level changes** that suggest that prevalence has shifted from some communities to others.
- 2 Ethiopia, Malawi, and Bangladesh witnessed significant decreases in under-18 prevalence rates at the national level, and these **decreases were also widespread at the sub-national level**.

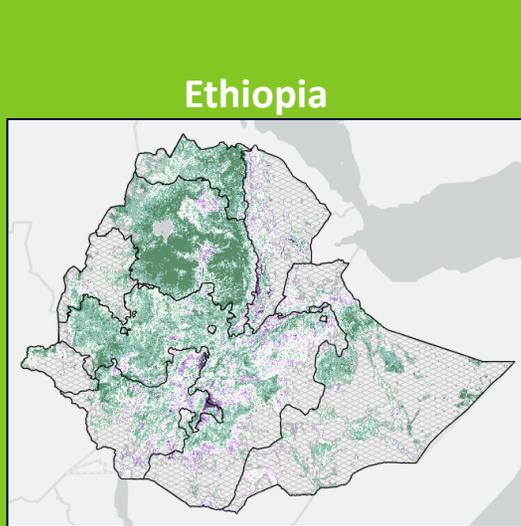
Country	Latest Under-18 Prevalence Rate	Historical Under-18 Prevalence Rate
Kenya	24.9% (2014)	25.9% (2003)
Ethiopia	40.6% (2016)	51.8% (2005)
Malawi	42.2% (2016)	51.1% (2004)
Senegal	34.9% (2016)	39.1% (2005)
Bangladesh	58.6% (2014)	66.2% (2007)



# MAPPING PREVALENCE AND BURDEN || TIME TREND ANALYSIS VISUALS

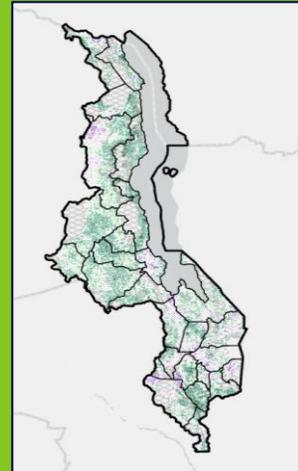
## Change in the Prevalence of Under-18 Child Marriage<sup>1</sup>

*Widespread National and Subnational Decreases*



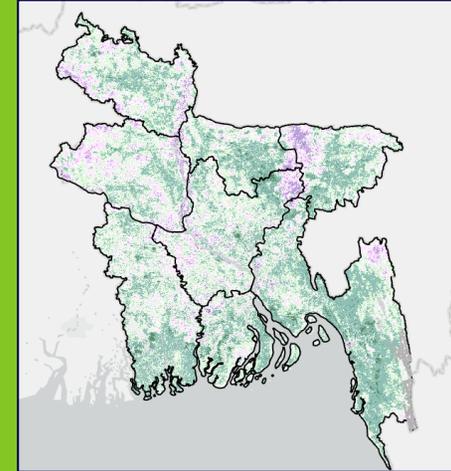
2005 to 2016

Malawi



2004 to 2016

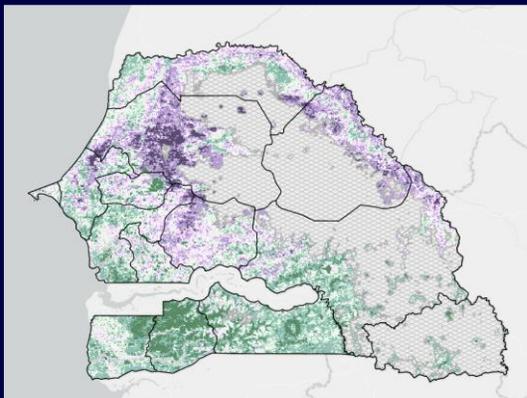
Bangladesh



2007 to 2014

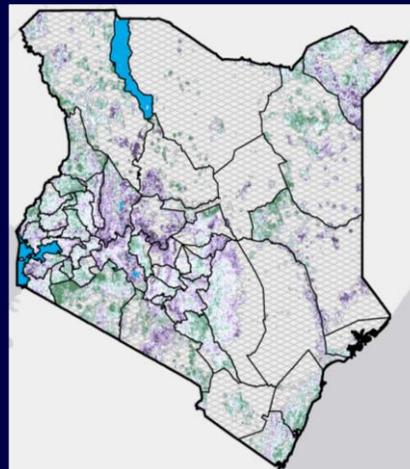
*Modest National Decreases and Significant Subnational Changes*

Senegal



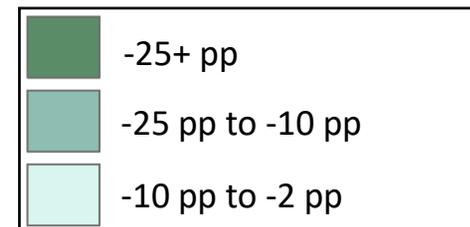
2005 to 2016

Kenya

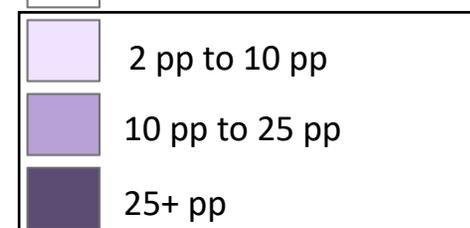
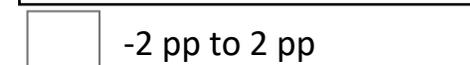


2003 to 2014

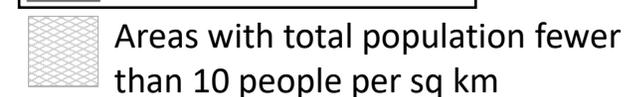
Percentage Point Change in U-18 Prevalence



Decrease



Increase



**Note 1:** Each map shows the change in under 18 child marriage prevalence at the 1km<sup>2</sup> level. Spatiotemporal analysis for India is not available due to lack of historical geo-tagged surveys.

# **Community Characteristics**



## COMMUNITY CHARACTERISTICS || METHODOLOGICAL APPROACH

Fraym identified certain community characteristics that could provide an understanding of the context in which child marriage takes place, then mapped these characteristics and analyzed the statistical relationships with child marriage.<sup>1</sup>

Socioeconomic Characteristics	
Adult Employment	<i>Expected Relationship</i> = Areas with higher employment or educational attainment may have lower rates of child marriage prevalence.
Adult Female Employment	
Educational Attainment by Sex	
Health and Nutrition	
Child Stunting	<i>Expected Relationship</i> = Child stunting may be higher due to early childbearing associated with child marriage; areas with higher usage of the health system may have lower rates of child marriage prevalence.
Health System Usage	
Sexual and Reproductive Health	
Modern Contraceptive Prevalence	<i>Expected Relationship</i> = The relationship between contraceptive prevalence and child marriage is complicated given the close relationship between adolescent childbearing and child marriage <sup>2</sup>
Infrastructure	
Access to Electricity	<i>Expected Relationship</i> = Areas with better infrastructure may have lower rates of child marriage prevalence.
Access to Improved Sanitation	

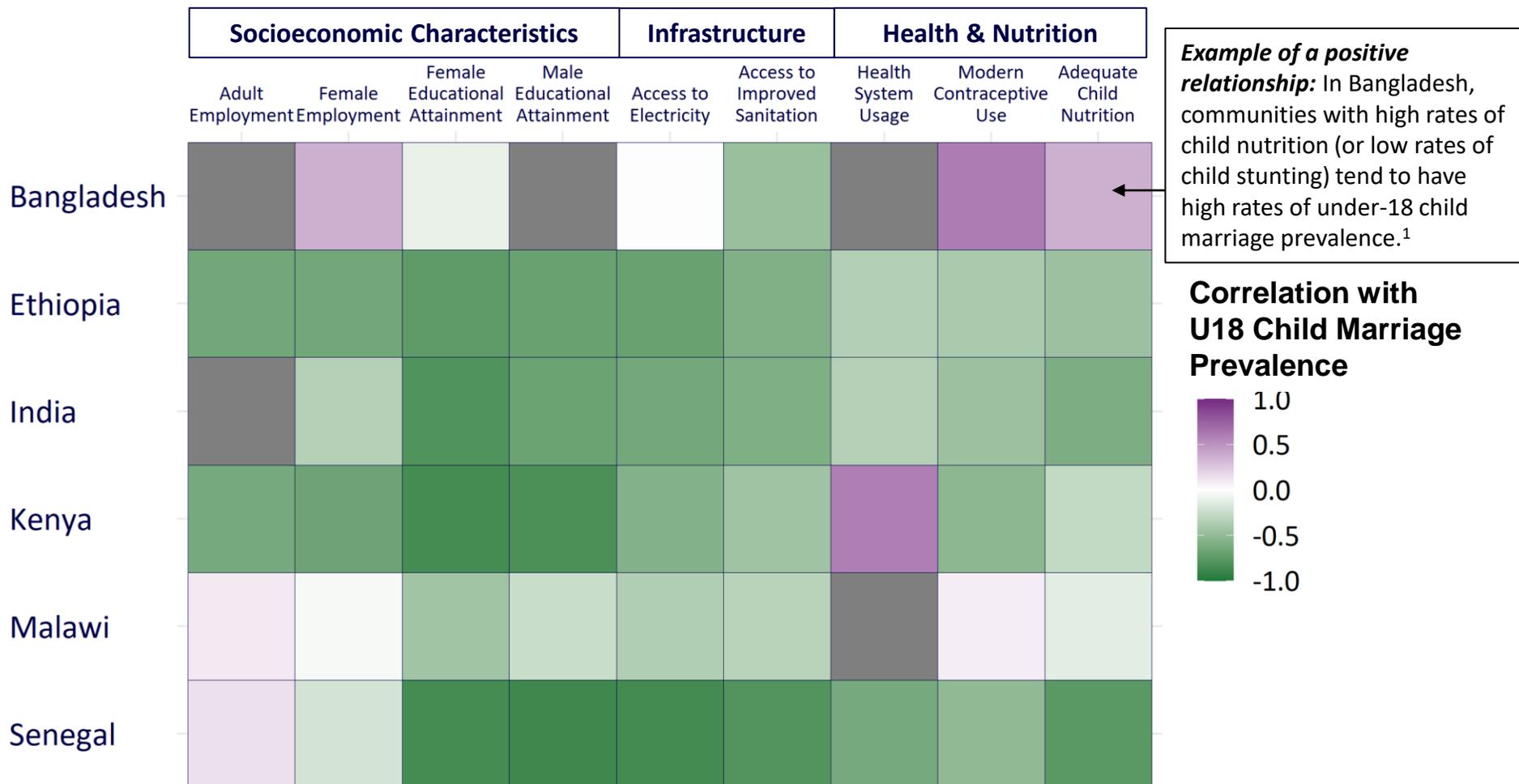
**Note 1:** Analyses are bivariate and thus do not control for other factors. Please see slides 29-37 and the appendix for indicator definitions.

**Note 2:** Increasing evidence suggests that many married adolescent girls report not using contraception due to a desire to become mothers. For example, see <https://reproductive-health-journal.biomedcentral.com/articles/10.1186/s12978-019-0686-9>

# COMMUNITY CHARACTERISTICS || METHODOLOGY AND CORRELATION MATRIX

Fraym explored a range of indicators that may provide an understanding of the community context in which child marriage takes place, then mapped and analyzed their relationships with child marriage at the community (1km<sup>2</sup>) level.

**Purple** indicates a **positive** relationship – under-18 prevalence and the indicator of interest move in the **same direction**.  
**Green** indicates a **negative** relationship – under-18 prevalence and the indicator of interest move in **opposite directions**.  
 The **darker** the color, the **stronger** the relationship.  
**Grey** indicates that data was not available for the community context indicator.



**Note 1:** Adequate child nutrition is defined as the inverse of child stunting to match the expected relationship of the other indicators with under-18 prevalence.



## COMMUNITY CHARACTERISTICS || SUMMARY FINDINGS

Certain community characteristics show consistent and expected relationships with child marriage prevalence irrespective of geographic context, which may shed light on important socio-environmental factors tied to the risk of child marriage.

- 1 General Relationships:** Communities with greater access to electricity and flush toilets, higher rates of educational attainment (male and female), and higher modern contraceptive use show lower rates of child marriage prevalence. Communities with higher rates of child stunting (or lower rates of child nutrition), on the other hand, demonstrate higher rates of child marriage.
- 2 Employment Impact is Common But May Vary:** Higher employment rates among adults in general and among females aged 15-49 in particular appear to be a strong protective factor in Ethiopia, Kenya, and India. However, there was little relationship between adult employment and child marriage prevalence rates in Senegal and Malawi. This suggests that the impact of employment-focused programs may vary depending on the localized context.
- 3 Health Facility Usage Impact is Contextual:** The relationship between child marriage and health facility usage appears to be highly contextual. In Senegal, Ethiopia, and India, greater usage is related with lower child marriage prevalence whereas in Kenya, communities with greater usage also show greater rates of child marriage prevalence.
- 4 Bangladesh is an Outlier:** Bangladesh stands out as an anomaly among the focus countries with unexpected relationships between child marriage prevalence and community characteristics in nearly every indicator examined. The country has witnessed recent improvements in poverty reduction and other areas of women's rights and health, such as educational gender inequality and maternal mortality.<sup>1</sup> Yet, these factors are not yet associated with lower child marriage prevalence across communities.

**Note 1:** Human Rights Watch, "Marry Before Your House is Swept Away: Child Marriage in Bangladesh," June 9, 2015. Available at: <https://www.hrw.org/report/2015/06/09/marry-your-house-swept-away/child-marriage-bangladesh>

# Mapping At- Risk Populations



## AT-RISK POPULATION || METHODOLOGICAL APPROACH

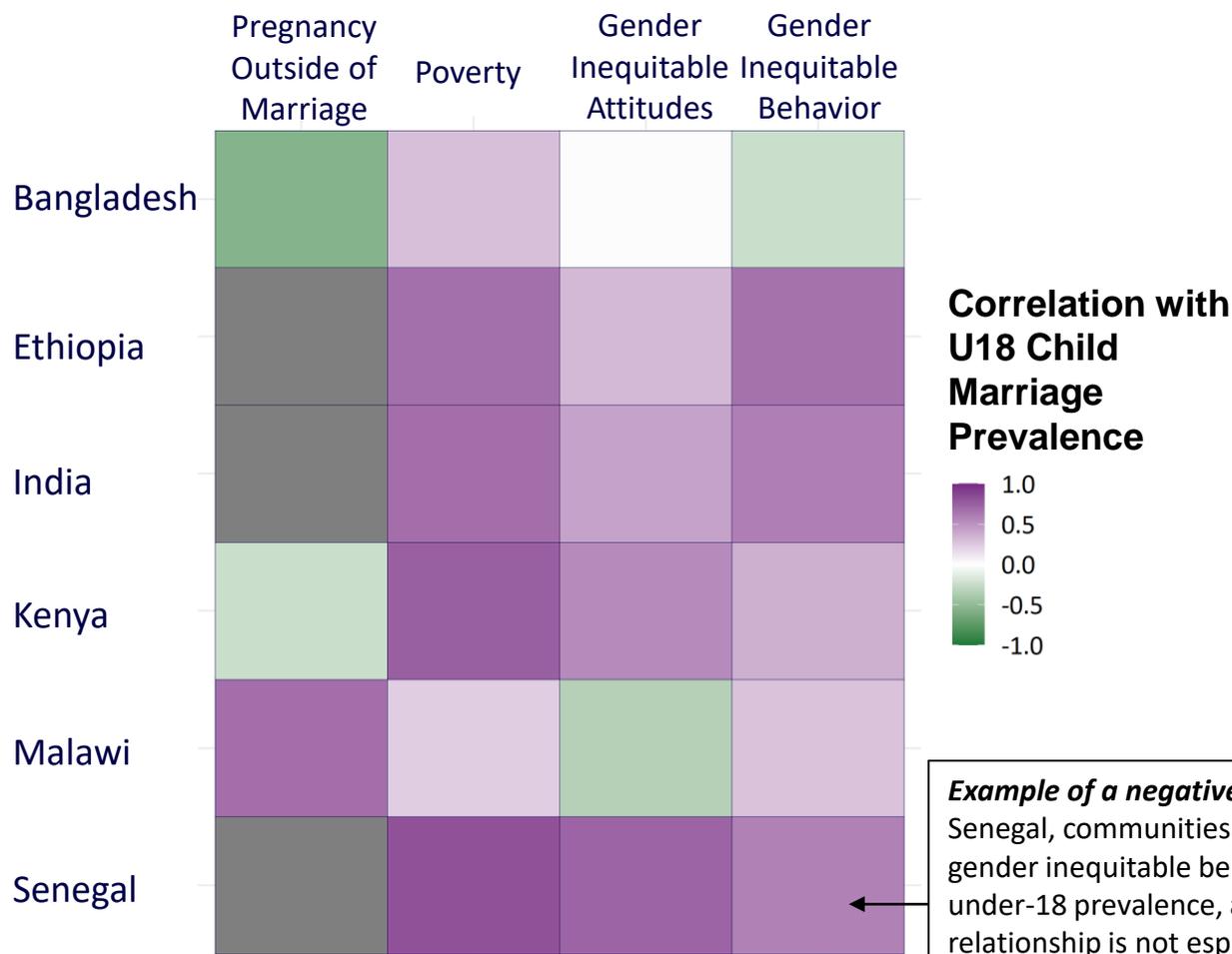
Fraym segmented the population at risk of child marriage based on three potential risk factors: (i) pregnancy outside of marriage; (ii) poverty; and (iii) gender-inequitable attitudes and behaviors.

- 1 Based on a summary of the literature and expert consultation, Fraym **examined relevant indicators to identify the presence of three potential risk factors** of child marriage.
- 2 Fraym then **estimated the potential risk factor profiles at the community level (1 km<sup>2</sup>) and categorized communities** as low-, medium-low, medium-high, or high-risk based upon national distribution patterns.
- 3 Finally, Fraym examined the relationship between these risk factor profiles and child marriage prevalence to **assess whether higher risk areas are also exhibit higher prevalence rates**.

## AT-RISK POPULATION || CORRELATION MATRIX

The table below provides a visual summary of the relationships between under-18 child marriage prevalence and each of the risk factor profiles across the six countries.

**Purple** indicates a **positive** relationship – under-18 prevalence and the indicator of interest move in the **same direction**.  
**Green** indicates a **negative** relationship – under-18 prevalence and the indicator of interest move in **opposite directions**.  
 The **darker** the color, the **stronger** the relationship.  
**Grey** indicates that data was not available for the community context indicator.



## AT-RISK POPULATION || SUMMARY FINDINGS

Across most focus countries, communities with high child marriage prevalence also had high levels of the examined risk factors. Bangladesh is an exception, with a weak relationship across all risk factors.

1

**Pregnancy-Related Risks:** In Ethiopia, Senegal, and India, pregnancy outside of marriage is very uncommon. Pregnancy outside of marriage represents a risk factor of child marriage to varying degrees in Bangladesh, Kenya, and Malawi. The literature suggests robust linkages between adolescent pregnancy and child marriage, but the directionality of the relationship is often unclear.

2

**Poverty-Related Risks:** Our analysis confirms the robust evidence base documenting that there is a strong relationship between poverty and child marriage across all 6 focus countries. The relationship in Kenya and Senegal is particularly strong, indicating that communities with high under-18 prevalence tend to also show poverty as a high-risk factor for child marriage.

3

**Gender Equitable Attitudes:** Gender attitudes, measured here as views about domestic violence, may be associated with lower rates of child marriage. We find evidence of this in Kenya, Ethiopia, Senegal, and India. However, there is no clear relationship in Bangladesh, and an unexplained negative relationship in Malawi that merits further study.

4

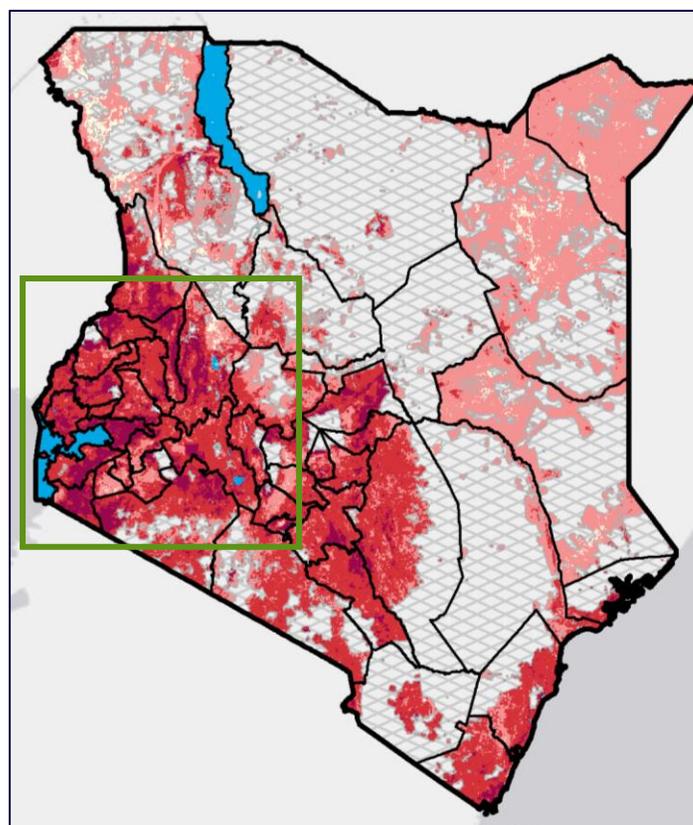
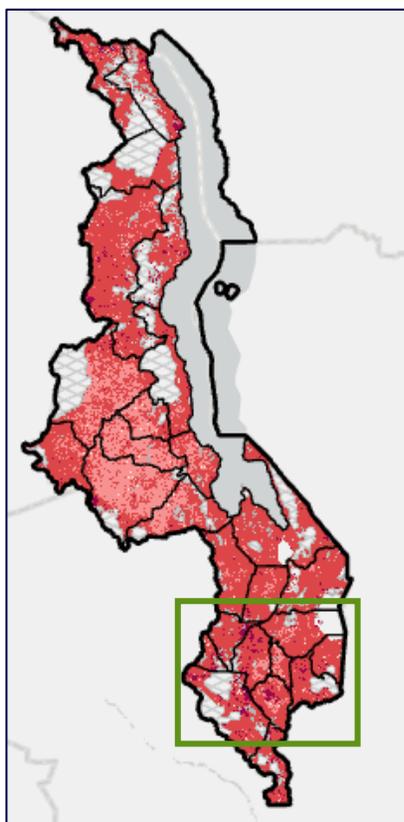
**Gender Equitable Behaviors:** Similarly, gender equitable behaviors, measured as women's participation in household decision-making, may be associated with lower rates of child marriage. We find supporting evidence of this in nearly all focus countries. However, the relationship is negative in Bangladesh, meaning communities with high rates of child marriage tend to be lower risk on gender inequitable attitudes. This finding also merits further examination.

## AT-RISK POPULATION || PREGNANCY RISK FACTOR MAPPING EXAMPLE

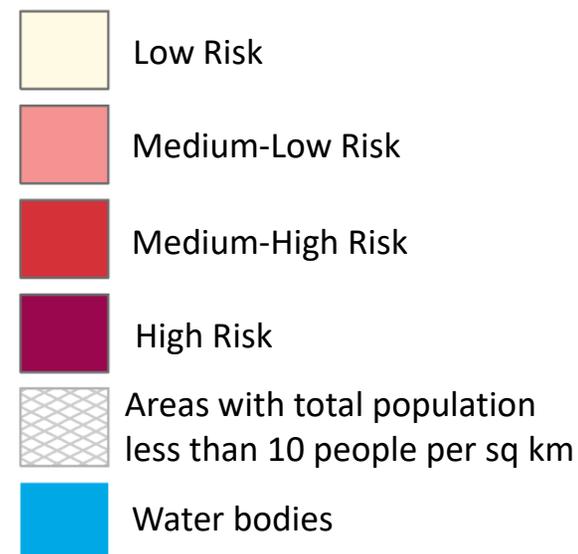
At the community level, pregnancy outside of marriage as a risk factor for child marriage varies across countries.

Across **Malawi**, pregnancy outside of marriage is low. However, communities with high rates of pregnancy outside of marriage tend to have high rates of under-18 prevalence, making pregnancy outside of marriage a high-risk factor.

In **Kenya**, pregnancy outside of marriage is quite common, and because of this, pregnancy outside of marriage is not a defining risk factor of child marriage.



### Pregnancy Outside of Marriage Risk Category<sup>1</sup>



**Note 1:** The map shows the classification of pregnancy outside of marriage for each 1km<sup>2</sup> cell into quartiles. Pregnancy outside of marriage is defined as the percent of women aged 15 to 24 who experienced a pregnancy outside of marriage, which includes women who have given birth before marriage or up until six months after marriage. The pregnancy outside of marriage risk categories range on a 1 to 4 scale, with 4 indicating the highest level of risk.

**Source:** Fraym, Malawi DHS 2016, Kenya DHS 2014, Worldpop 2020

# Appendix

- I. About Fraym
- II. Methodological Approach
- III. Definitions



# MAPPING HUMANITY

We use advanced machine learning models to produce unprecedented, local information on human and population characteristics in critical geographies around the world—down to 1km<sup>2</sup> even in remote areas.

# APPENDIX || METHODOLOGICAL APPROACH

Fraym has built machine learning (ML) software that weaves together geo-tagged household survey data with satellite imagery to create localized population information (1 km<sup>2</sup>).

1

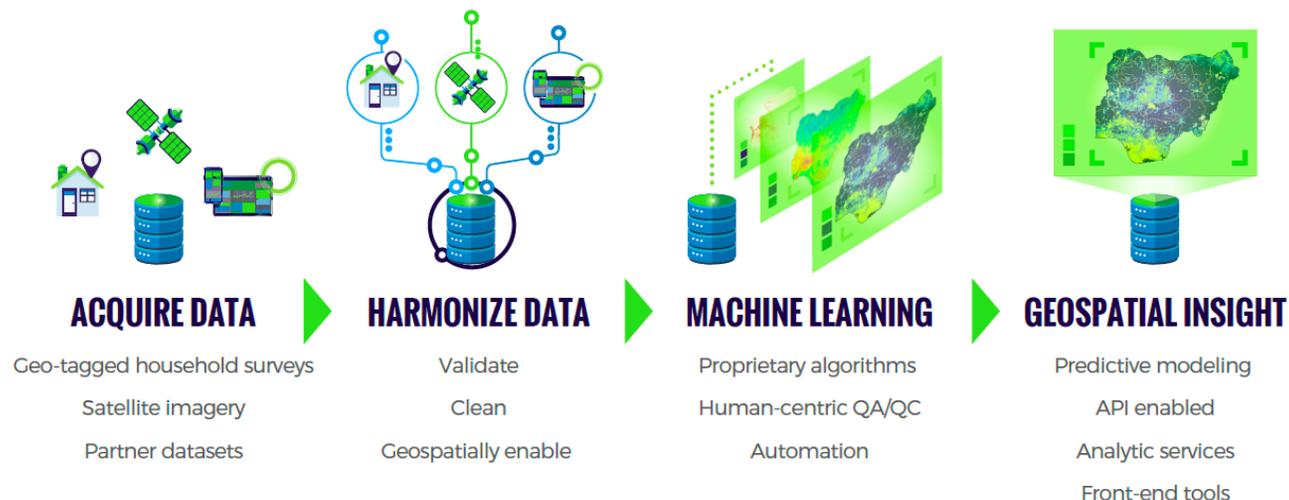
The primary ML model input is data from high-quality, geo-tagged household surveys. Key indications of a high-quality household survey include implementing organization(s), sample design, sample size, and response rates. After data collection, *post-hoc* sampling weights are created to account for any oversampling and ensure representativeness.

2

The second major data input is satellite imagery and related derived data products, including earth observation (EO) data, gridded population information (e.g., human settlement mapping, etc.), proximity to physical locations (e.g., health clinics, ports, roads, etc.) and biophysical surfaces like soil characteristics. As with the survey data, Fraym data scientists ensure that the software only uses high-quality imagery and derivative inputs.

3

To create spatial layers from household survey data, Fraym leverages machine learning to predict an indicator of interest at a 1 square kilometer resolution. This methodology builds upon existing, tested methodologies for interpolation of spatial data. The resulting model is used to predict the survey data for all non-enumerated areas. A similar approach was originally developed by academic researchers focused on health outcomes, which were expanded upon by USAID's Demographic and Health Surveys program since then by Fraym and others.<sup>1</sup>



**Note 1:** Gething, Peter, Andy Tatem, Tom Bird, and Clara R. Burgert-Brucker. 2015. Creating Spatial Interpolation Surfaces with DHS Data DHS Spatial Analysis Reports No. 11. Rockville, Maryland, USA: ICF International. Other notable, relevant work includes: Weiss DJ, Lucas TCD, Nguyen M, et al. Mapping the global prevalence, incidence, and mortality of *Plasmodium falciparum*, 2000–17: a spatial and temporal modelling study. Lancet 2019 and Tatem A, Gething P, Pezzulo C, Weiss D, and Bhatt S. 2014. Final Report: Development of High-Resolution Gridded Poverty Surfaces. University of Southampton.

<https://www.worldpop.org/resources/docs/pdf/Poverty-mapping-report.pdf>

## APPENDIX || DEFINITIONS

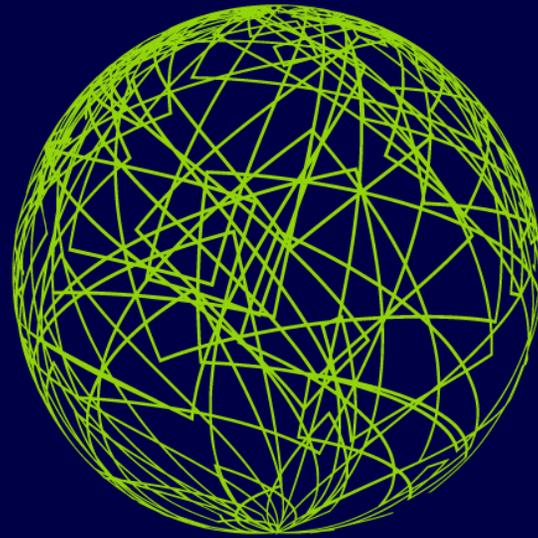
Indicator	Description
<b>Child Marriage</b>	
Under-18 Child Marriage Prevalence	Percent of women (aged 20-24) who were married before age 18. Women married before age 18 include both those who are currently married and formerly married. Per the DHS, those who report that they are married or living with a partner are considered in union and therefore this indicator is based off the age at first marriage or co-habitation.
Under-18 Child Marriage Burden	The number of women (aged 20-24) who were married before age 18. Burden is calculated using population data from WorldPop.
Under-15 Child Marriage Prevalence	Percent of women (aged 20-24) who were married before age 15. Women married before age 15 include both those who are currently married and formerly married. Per the DHS, those who report that they are married or living with a partner are considered in union and therefore this indicator is based off the age at first marriage or co-habitation.
Under-15 Child Marriage Burden	The number of women (aged 20-24) who were married before age 15. Burden is calculated using population data from WorldPop.

## APPENDIX || DEFINITIONS

Indicator	Description
<b>Community Context</b>	
Adult Employment	Percent of adults (aged 15-49) who are employed. An adult is employed if he or she reports working in the last 7 days.
Adult Female Employment	Percent of women (aged 15-49) who are employed. A woman is employed if she reports working in the last 7 days.
Female Educational Attainment	Percent of women (aged 18-49) who completed at least primary school.
Male Educational Attainment	Percent of men (aged 18-49) who completed at least primary school.
Modern Contraceptive Use	Percent of women (aged 15-24) who are sexually active and use a modern contraceptive method. Per the DHS, modern methods exclude periodic abstinence and withdrawal, which are considered traditional methods.
Health System Usage	Percent of women (aged 15-49) who visited a health facility or have been visited by a fieldworker to talk about family planning in the past 12 months.
Child Stunting	Percent of children under five who are stunted.
Access to Electricity	Percent of individuals that live in a household with access to electricity.
Flush Toilet	Percent of individuals that live in a household with a flush toilet.

## APPENDIX || DEFINITIONS

Indicator	Description
<b>Risk Profiles</b>	
Pregnancy Outside of Marriage	Pregnancy outside of marriage is defined as the percent of women aged 15 to 24 who experienced a pregnancy outside of marriage, which includes women who have given birth before marriage or up until six months after marriage. By definition, a women who experienced pregnancy outside of marriage is ever-married. Therefore, never-married women who gave birth are not considered to have experienced a pregnancy outside of marriage. The pregnancy outside of marriage risk categories range on a 1 to 4 scale, with 4 indicating the highest level of risk.
Poverty	Fraym selected four indicators to capture child marriage related poverty: (i) wealth index; (ii) employment in unskilled manual labor or self-employment in agriculture for women aged 15 to 24; (iii) educational attainment of the household head; and (iv) employment in unskilled manual labor or self-employment in agriculture for the household head. Fraym then combined these indicators using a principal components analysis (PCA) to produce an index. The poverty index risk categories range on a 1 to 4 scale, with 4 indicating the highest level of risk.
Attitudes towards Domestic Violence	Attitudes towards domestic violence is defined as the percent of adults aged 15 to 49 who agree with at least one reason that a husband is justified in hitting or beating his wife. Respondents were asked whether a husband is justified in beating his wife under a series of circumstances: if the wife burns the food, argues with him, goes out without telling him, neglects the children, or refuses sexual relations. The attitudes towards wife beating risk categories range on a 1 to 4 scale, with 4 indicating the highest level of risk.
Women’s Participation in Decision Making	Fraym selected five indicators to assess women’s participation in decision making in the household: (i) woman’s health care; (ii) large household purchases; (iii) visits to family; (iv) what food should be cooked each day; (v) husband’s earnings. Fraym then combined these indicators using a principal components analysis (PCA) to produce an index. The women’s participation in decision-making index risk categories range on a 1 to 4 scale, with 4 indicating the highest level of risk. In Bangladesh, India, and Senegal women’s participation in decision making is defined as the percent of currently married women (aged 15-49) who do not participate in any household decisions.



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