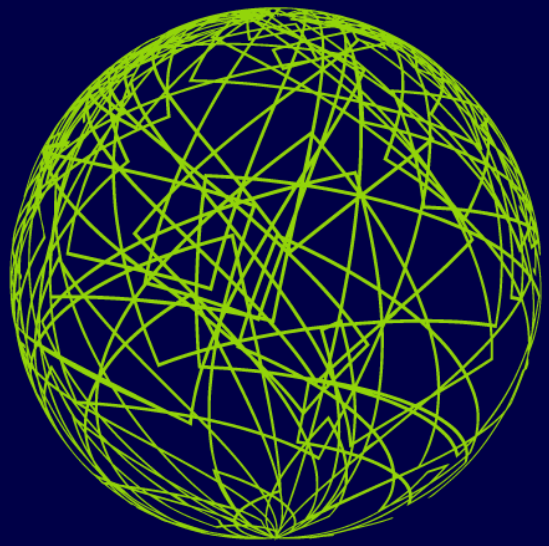

fraym

Analyzing Girl Child Marriage: Ethiopia Deep Dive

Prepared for the Child Marriage Learning Partners Consortium

With Support from the Bill & Melinda Gates Foundation

22 March 2021

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About Fraym

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^2 even in remote areas.

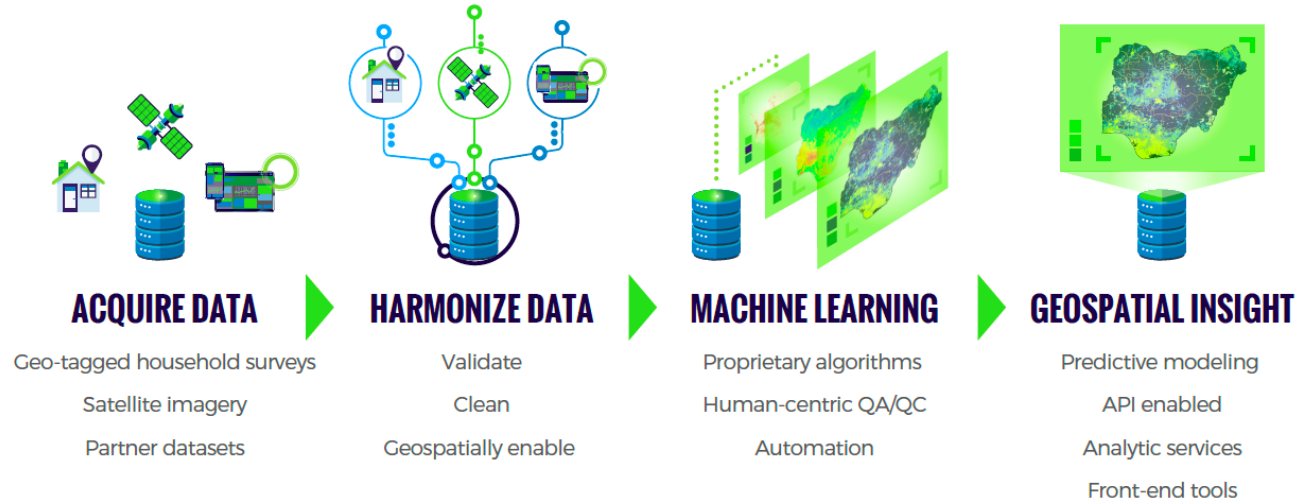
ABOUT FRAYM || METHODOLOGICAL APPROACH

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^2).

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.[1]



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

Report Overview

REPORT OVERVIEW || ANALYTIC FRAMEWORK

Fraym produced hyperlocal visualizations of girl child marriage prevalence and burden, community contexts, and potential risk factors to child marriage in Ethiopia.

1. Fraym **mapped the prevalence and burden of under-18 and under-15 girl child marriage and analyzed spatiotemporal trends** from 2005, 2011, and 2016 in Ethiopia.

2. 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 employment and education, as well as less explored factors, such as access to electricity or improved sanitation at home.

3. In order to assess the populations vulnerable to child marriage, Fraym **developed three profiles that capture potential risk factors 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 high risk communities and to estimate the number of at-risk girls between the ages of 10 and 14 years old.

4. Finally, Fraym conducted **hotspot analysis to more deeply explore areas** of high child marriage prevalence.

5. In addition to Ethiopia, Fraym used this same analytical framework to produce country reports for Bangladesh, India, Kenya, Malawi, Senegal, and Nigeria, as well as a cross-country synthesis report, as part of the Child Marriage Learning Partners Consortium.[1]

Note 1: 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.

The results of this report can help to inform policy, bolster advocacy, and further knowledge.

1. **Under-18 child marriage prevalence has been declining across the country** (with especially high rates of decline in Amhara) but remains high at the national level (41 percent) with rates as high as 66 percent in some regions.

2. Fraym **identified three regions as hotspots of child marriage**: (i) Afar; (ii) Somali; and (iii) Amhara. Afar and Somali have some of the highest under-18 prevalence rates. Amhara, which witnessed notable improvements, still has the second highest burden level in the country.

3. **Communities where poverty represents a high risk for child marriage are widespread** throughout Ethiopia, whereas **pregnancy outside of marriage as a potential risk factor is almost non-existent.**

4. The relationship between child marriage and other community characteristics is largely in accord with the existing literature.

Mapping Prevalence and Burden

MAPPING PREVALENCE AND BURDEN || SECTION OVERVIEW

Fraym mapped the prevalence and burden of under-18 and under-15 child marriage and analyzed spatiotemporal trends spanning 2005 to 2016.

1. Fraym's analysis **focused primarily on the cohort of women aged 20 to 24**. Under-18 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. Similarly, under-15 child marriage is defined as women aged 20 to 24 at the time of survey enumeration and who were married before age 15.[1] Burden is the number of women who were married before age 18 and 15.

2. Using the most recently available geo-tagged household survey (2016), **Fraym mapped under-18 and under-15 child marriage prevalence and burden at the national, region, zone, and community level (1km^2)**.

3. Next, Fraym examined two previous survey intervals (2005 and 2011) in order to **assess spatiotemporal trends across the full time period (2005 to 2016), as well as in shorter intervals (2005 to 2011 and 2011 to 2016).**

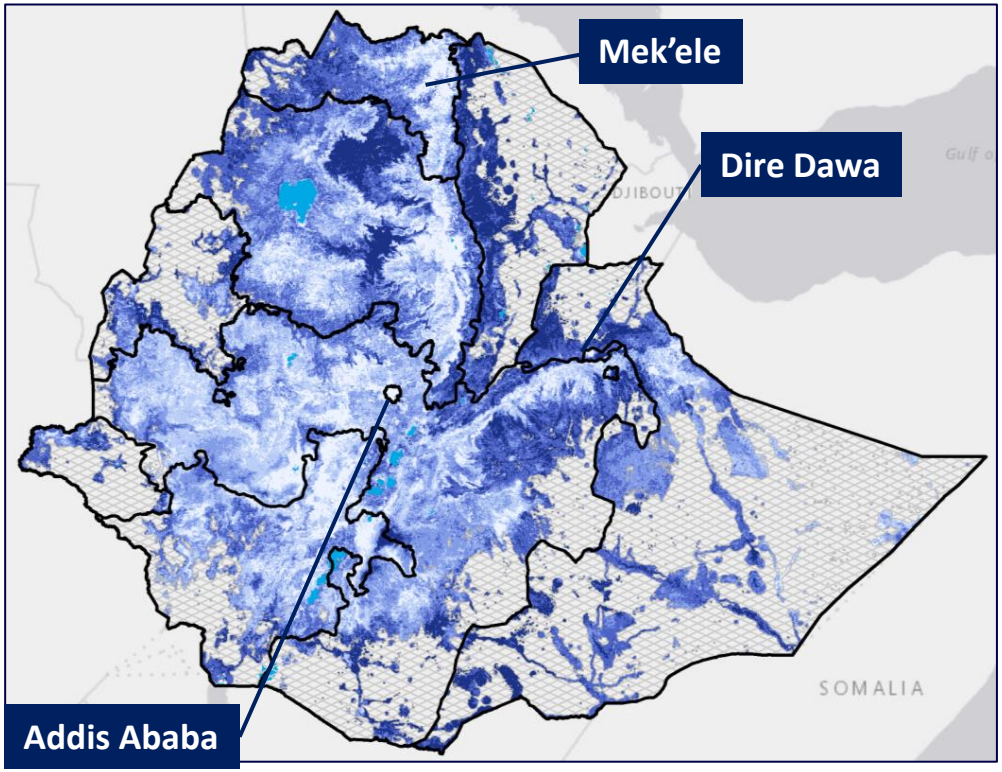
4. This mapping and associated analysis can help researchers, policymakers, and other decision-makers to target their future activities and resource allocation.

Note 1: Please see the appendix for more detailed information on the definition.

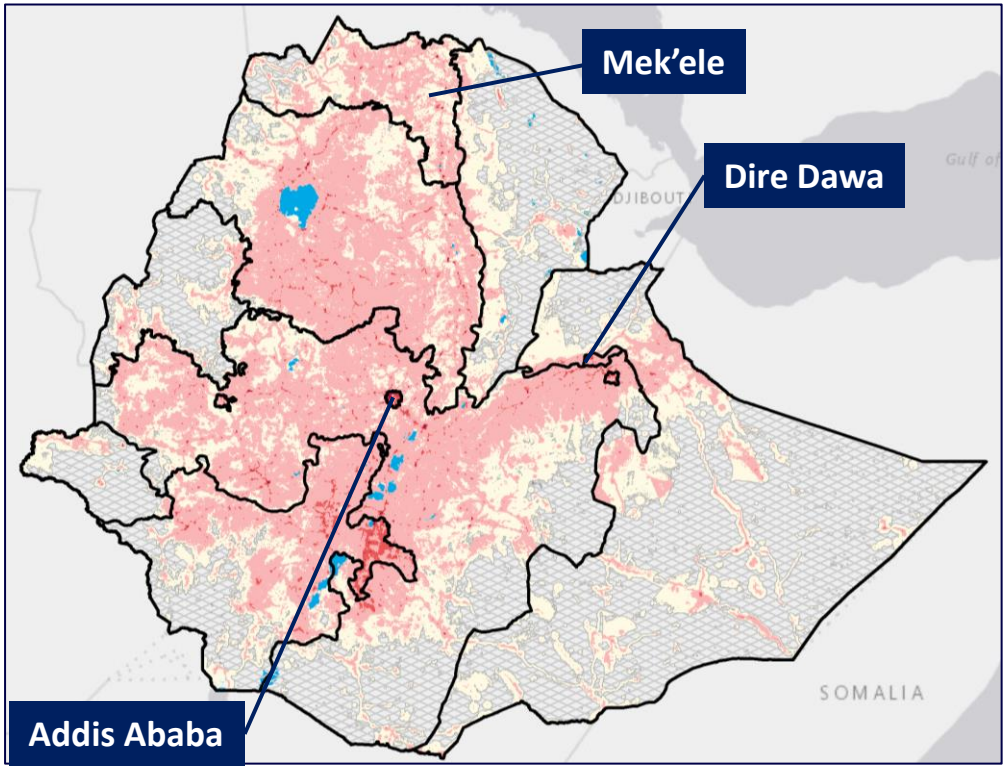
MAPPING PREVALENCE AND BURDEN || UNDER-18 (2016)

Nationally, 41 percent of women aged 20-24, or 1.7 million women, were married before age 18. Prevalence is concentrated in the northeast, whereas burden is more concentrated in population-dense cities.

Under-18 Prevalence



Under-18 Burden



Percent of women (aged 20-24) who were married before 18

0% — 65%+

Areas with total population less than 10 people per sq km

City Large cities

Number of women (aged 20-24) who were married before 18

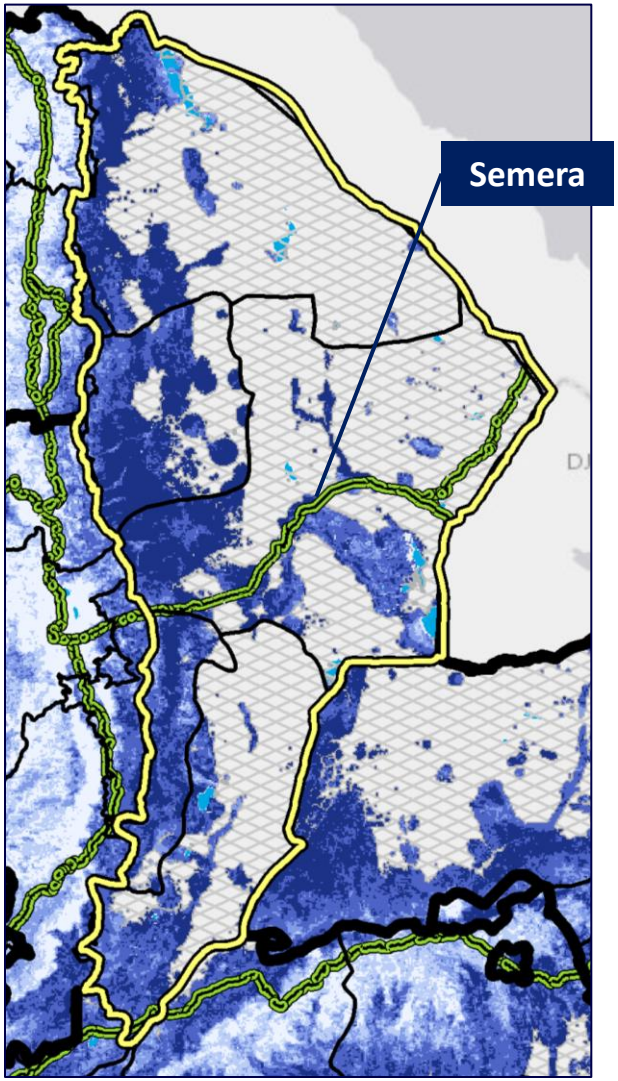
0 — 100+

Source: Fraym, Ethiopia DHS 2016, WorldPop 2016

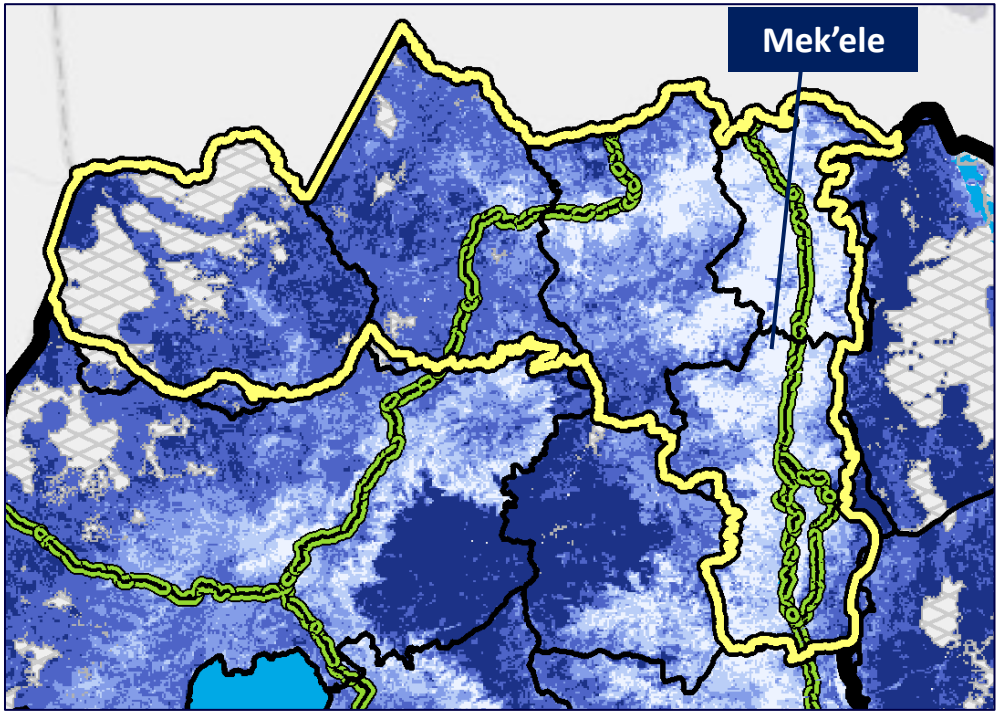
MAPPING PREVALENCE AND BURDEN || HIGH PREVALENCE REGION EXAMPLES

Within a region, the prevalence of child marriage can vary across communities. In Afar, high prevalence is widespread, while in Tigray, it is concentrated in the west.

The Afar region has the highest under-18 prevalence rate – 66 percent.

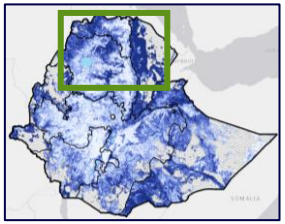


In Tigray, the under-18 prevalence rate is 41 percent, on par with the national rate.



Percent of women (aged 20-24) who were married before 18

0% **65%+**



Areas with total population less than 10 people per sq km

City Region capital

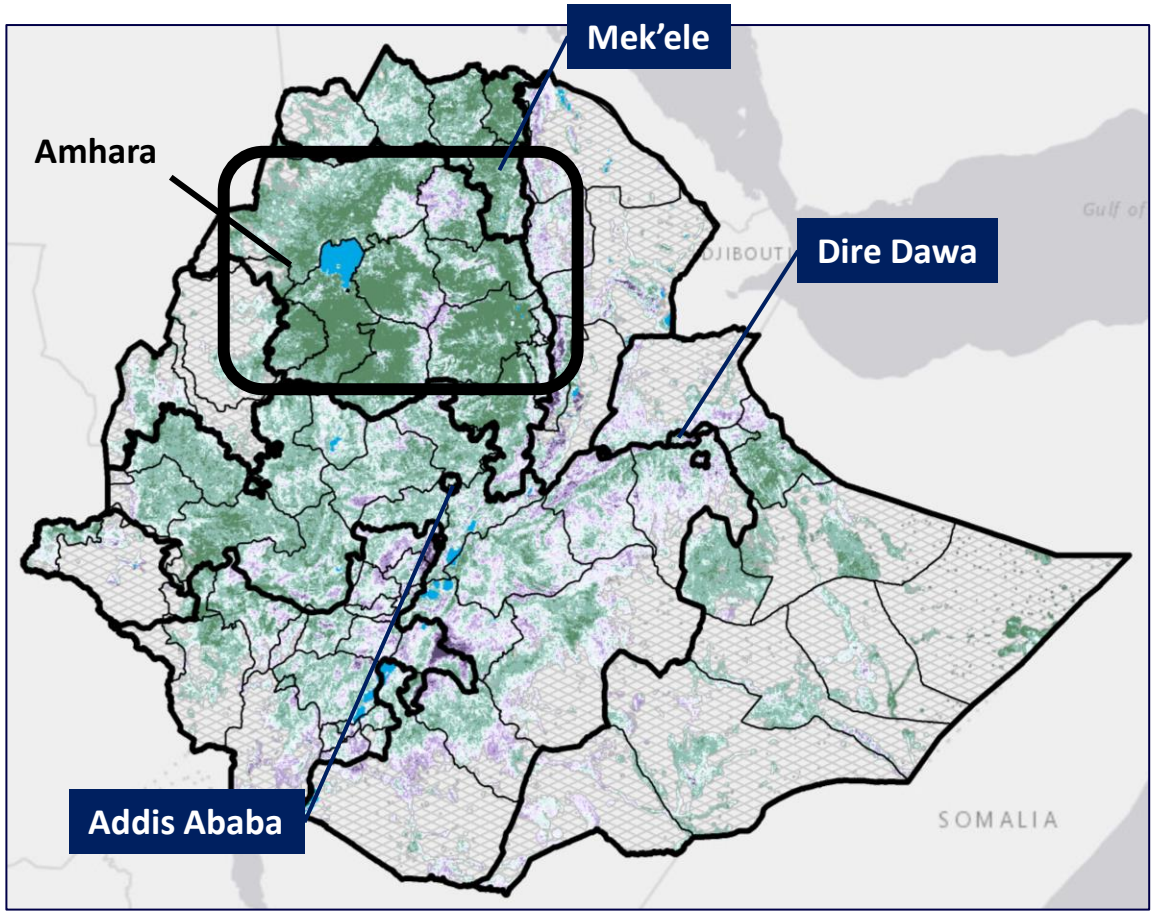
Major Roads

Source: Fraym, Ethiopia DHS 2016, OpenStreetMaps

MAPPING PREVALENCE AND BURDEN || UNDER-18 TIME SERIES (2005 to 2016)

Most of Ethiopia experienced improvements in under-18 child marriage from 2005 to 2016, most notably in Amhara.

Change in the Prevalence of Under-18 Child Marriage: 2005 to 2016[1]



National Under-18 Prevalence

2005	2016
51.8%	40.6%

Percentage Point (pp) Change in Under 18 Prevalence from 2005 to 2016

- -25+ pp
- -25 pp to -10 pp
- -10 pp to -2 pp

Decrease

- -2 pp to 2 pp
- 2 pp to 10 pp
- 10 pp to 25 pp
- 25+ pp

Increase

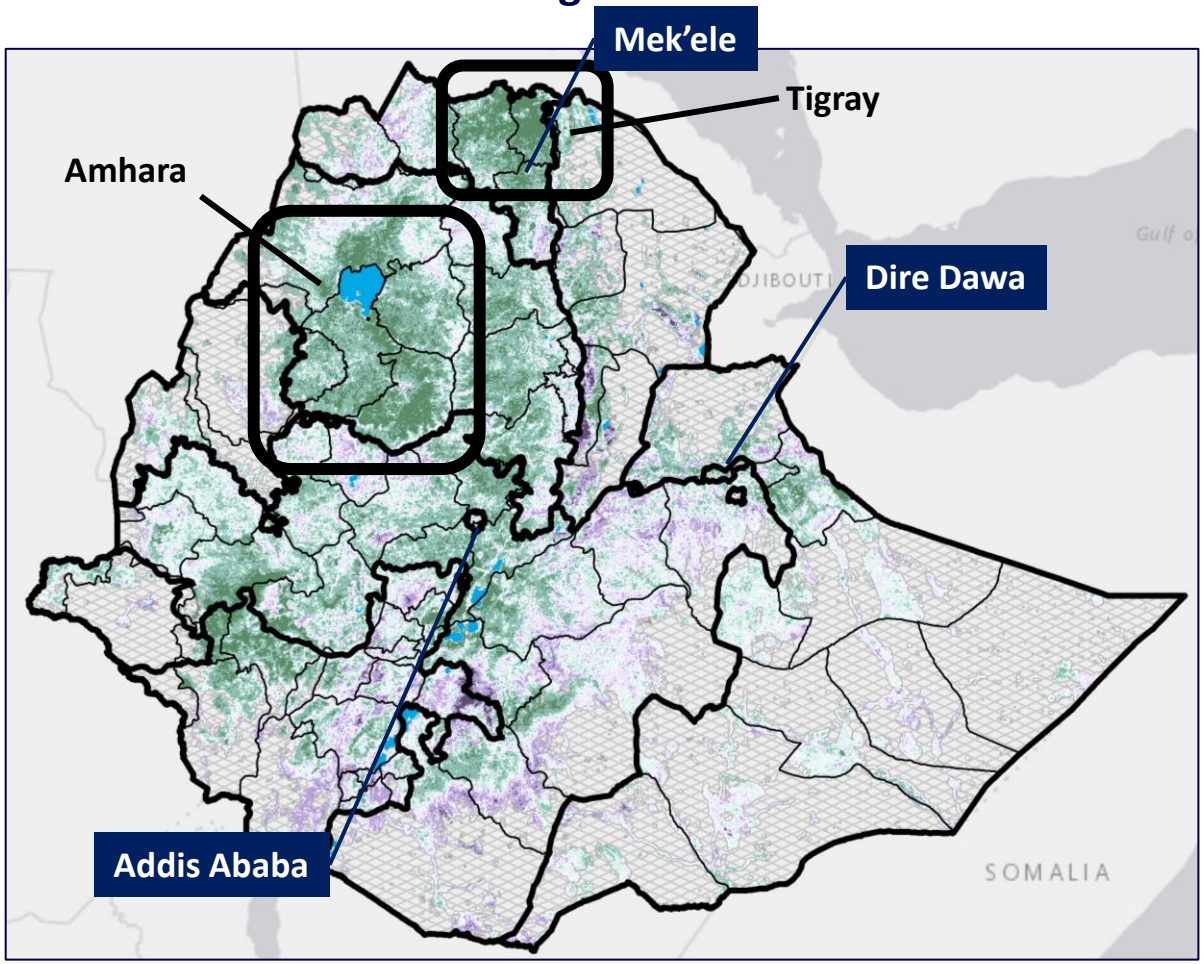
- Areas with total population less than 10 people per sq km
- Water bodies
- City — Large cities

Note 1: Modeled estimates at the sq km level in 2005 for Dire Dawa do not meet Fraym quality standards. As a result, estimates in this region should be considered as less precise and interpreted with caution. Fraym does not present statistics below the region level for 2005.
Source: Fraym, Ethiopia DHS (2016 and 2005)

MAPPING PREVALENCE AND BURDEN || UNDER-18 TIME SERIES INTERVAL (2005 to 2011)

In the first phase of analysis (2005 – 2011), the prevalence of under-18 child marriage largely decreased across the country, especially in Amhara and Tigray.

Change in the Prevalence of Under-18 Child Marriage: 2005 to 2011[1]



National Under-18 Prevalence

2005	2011
51.8%	43.5%

Percentage Point (pp) Change in Under 18 Prevalence from 2005 to 2011

- -25+ pp
- -25 pp to -10 pp
- -10 pp to -2 pp

Decrease

- -2 pp to 2 pp
- 2 pp to 10 pp
- 10 pp to 25 pp
- 25+ pp

Increase

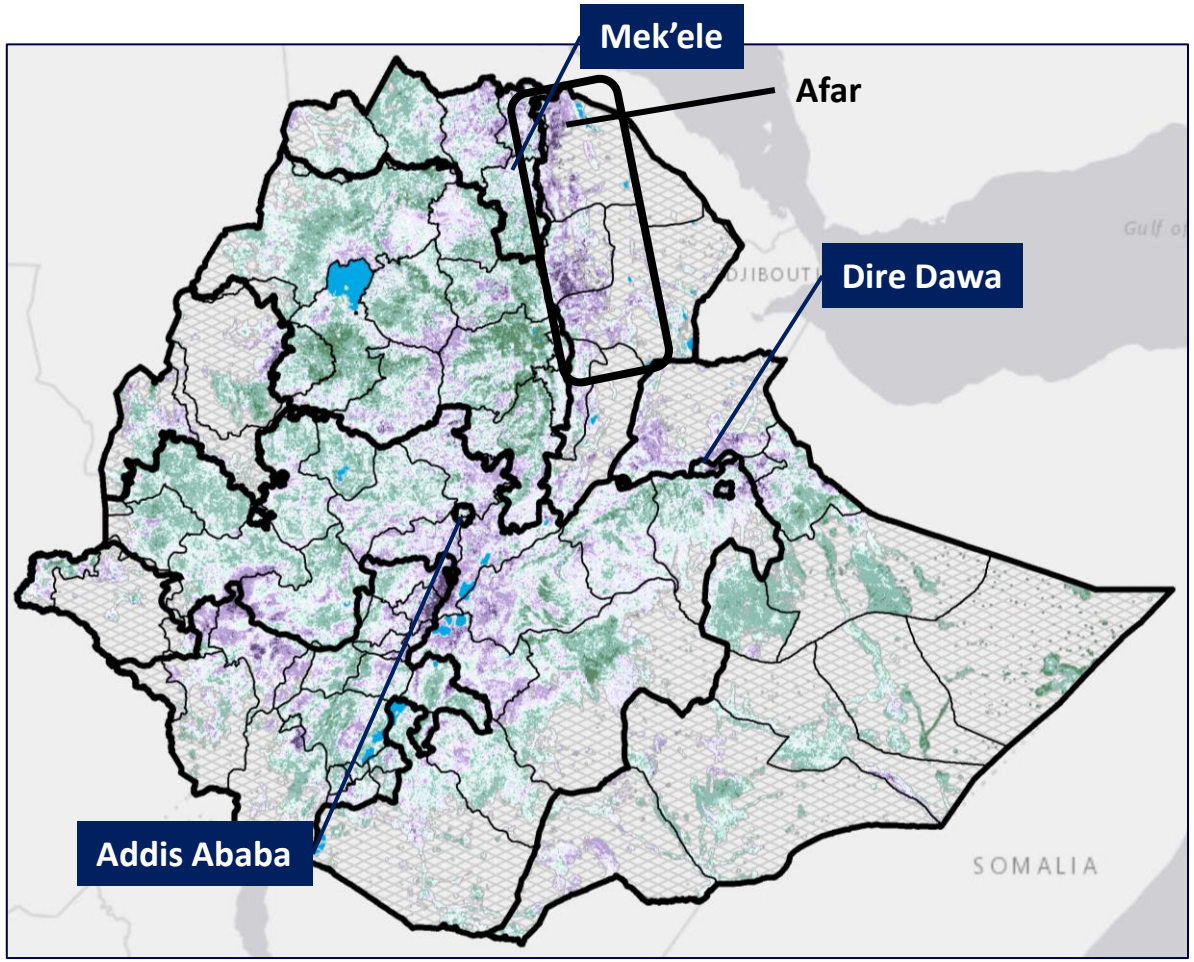
- Areas with total population less than 10 people per sq km
- Water bodies
- City — Large cities

Note 1: Modeled estimates at the sq km level in 2005 for Dire Dawa do not meet Fraym quality standards. As a result, estimates in this region should be considered as less precise and interpreted with caution. Fraym does not present statistics below the region level for 2005.
Source: Fraym, Ethiopia DHS (2011 and 2005)

MAPPING PREVALENCE AND BURDEN || UNDER-18 TIME SERIES INTERVAL (2011 to 2016)

In the next phase of analysis (2011 – 2016), the decrease in under-18 child marriage is less pronounced, and in Afar, most communities experienced an increase.

Change in the Prevalence of Under-18 Child Marriage: 2011 to 2016



National Under-18 Prevalence

2011	2016
43.5%	40.6%

Percentage Point (pp) Change in Under 18 Prevalence from 2011 to 2016

- -25+ pp
- -25 pp to -10 pp
- -10 pp to -2 pp

Decrease

- -2 pp to 2 pp

- 2 pp to 10 pp
- 10 pp to 25 pp
- 25+ pp

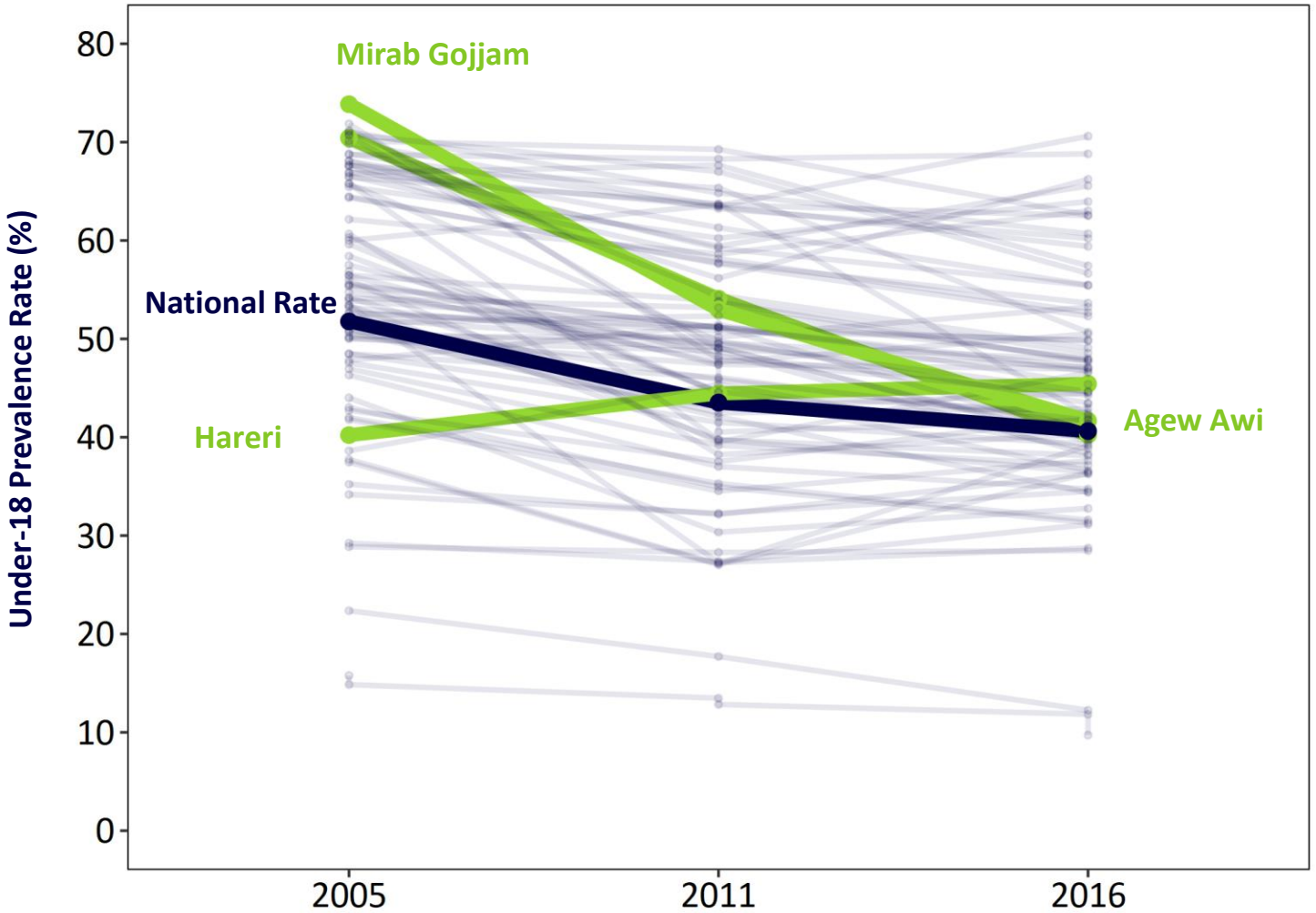
Increase

- Areas with total population less than 10 people per sq km
- Water bodies
- City — Large cities

Source: Fraym, Ethiopia DHS (2016 and 2011)

At the zone level, trends of under-18 prevalence vary over time. Mirab Gojjam and Agew Awi saw the largest decrease from 2005 to 2016. Hareri saw the largest increase, though this increase was relatively small.

Change in the Under-18 Child Marriage Prevalence Rate, by Zone[1]



Note 1: Modeled estimates at the sq km level in 2005 for Dire Dawa do not meet Fraym quality standards. As a result, estimates in this region should be considered as less precise and interpreted with caution. Statistics for zones in this region are not presented.
Source: Fraym, Ethiopia DHS (2016, 2011, and 2005)

MAPPING PREVALENCE AND BURDEN || ZONES WITH LARGEST INCREASE/DECREASE

From 2005 to 2016, while several zones experienced *increases* (particularly in Afar and SNNPR), there were 39 zones that experienced double-digit *decreases*.[1,2]

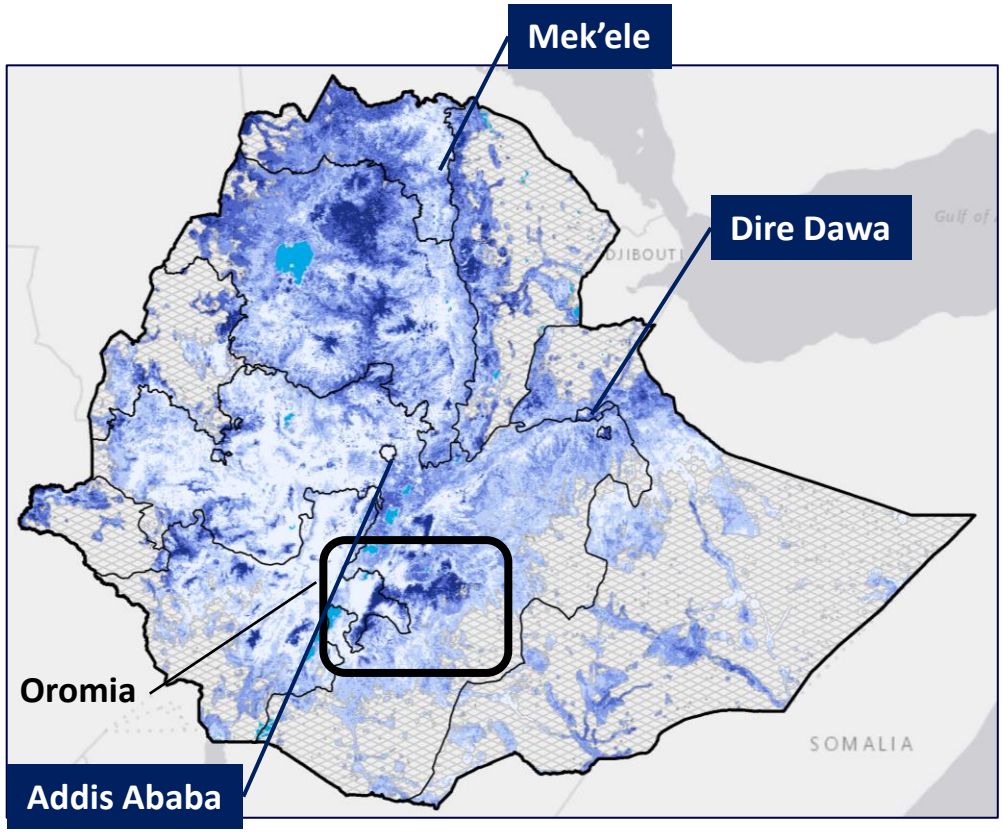
Largest Percentage Point Increase in Under-18 Prevalence (2005 to 2016)	
Harari (Harari)	+ 5 pp
Konso (SNNPR)	+ 3 pp
Afar Zone 5 (Afar)	+ 3 pp
Hadiya (SNNPR)	+ 2 pp
Silti (SNNPR)	+1 pp
Gurage (SNNPR)	+ 1 pp
Afar Zone 3 (Afar)	+ 1 pp
Afar Zone 4 (Afar)	+1 pp

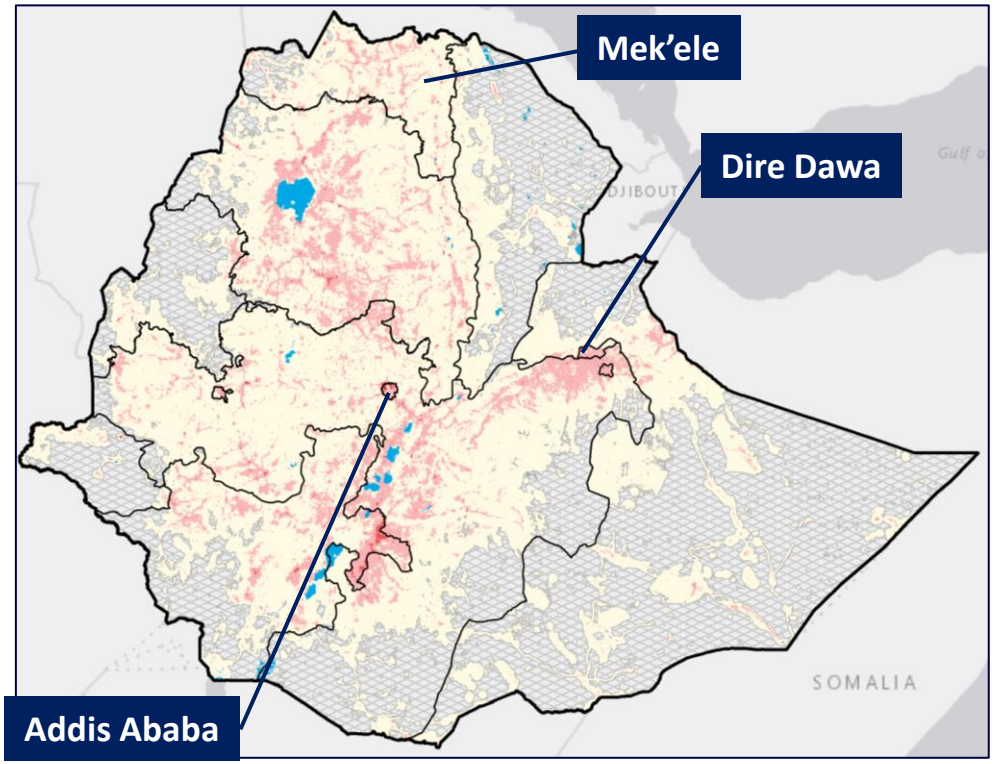
Largest Percentage Point Decrease in Under-18 Prevalence (2005 to 2016)	
Mirab Gojjam (Amhara)	- 32 pp
Agew Awi (Amhara)	- 30 pp
Sheka (SNNPR)	- 28 pp
Misraq Gojjam (Amhara)	- 28 pp
Misraqawi (Tigray)	- 25 pp
Doolo (Somali)	- 24 pp
Debub Wollo (Amhara)	- 24 pp
Debub Gondar (Amhara)	- 23 pp
Semen Wello (Amhara)	- 22 pp
Semen Gondar (Amhara)	- 21 pp

Note 1: Fraym calculated the percentage point (pp) difference between 2005 and 2016 to determine whether a zone witnessed an increase or decrease in under-18 prevalence. In the tables above, the region is listed in parentheses. The SNNPR region is the Southern Nations, Nationalities, and People's Region.
Note 2: Modeled estimates at the sq km level in 2005 for Dire Dawa do not meet Fraym quality standards. As a result, estimates in this region should be considered as less precise and interpreted with caution. Statistics for zones in this region are not presented.
Source: Fraym, Ethiopia DHS (2016, 2005)

MAPPING PREVALENCE AND BURDEN || UNDER-15 (2016)

Child marriage before the age of 15 is concentrated primarily in the north with smaller pockets elsewhere, such as southern Oromia.





Percent of women (aged 20-24) who were married before 15

0% — **35%+**

Areas with total population less than 10 people per sq km

Number of women (aged 20-24) who were married before 15

0 — **100+**

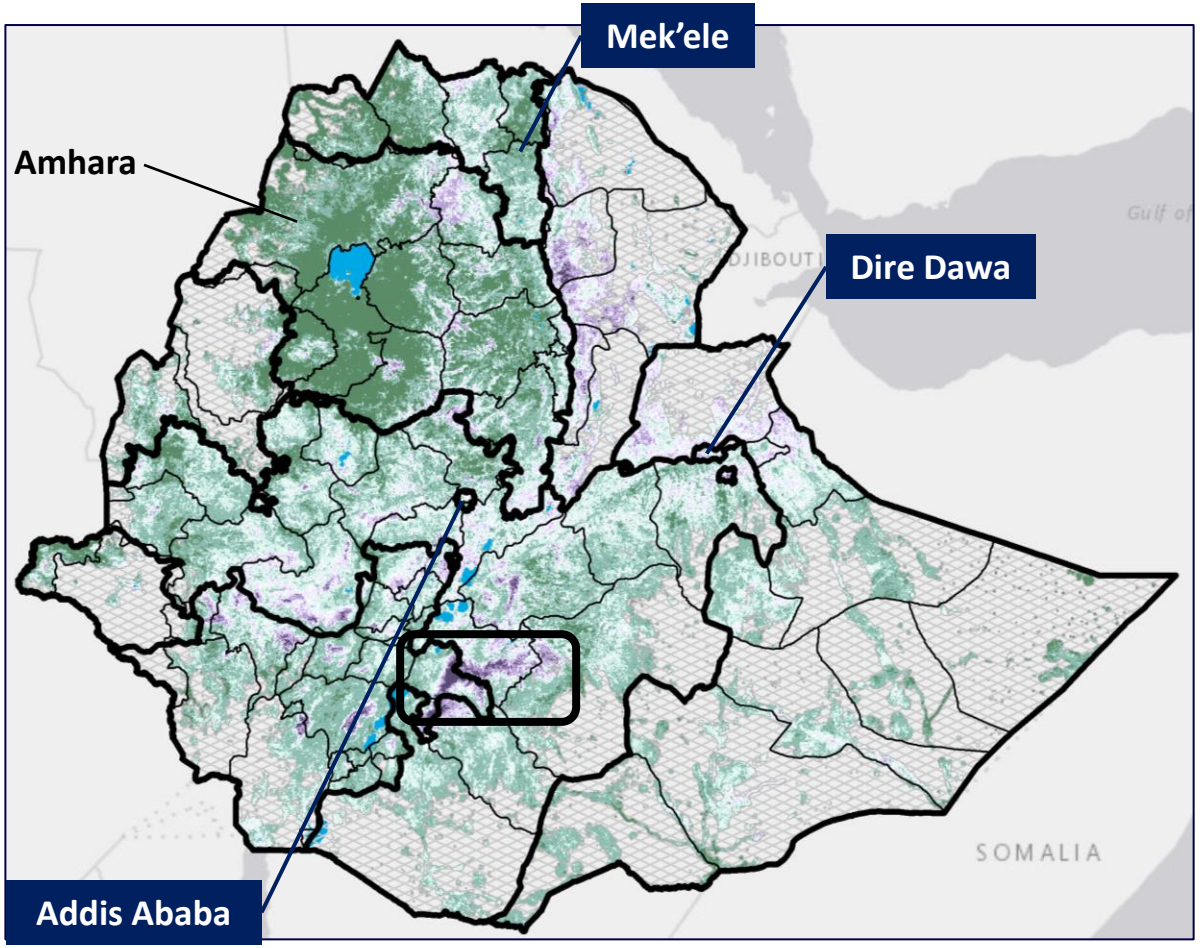
City Large cities

Source: Fraym, Ethiopia DHS 2016

MAPPING PREVALENCE AND BURDEN || UNDER-15 TIME SERIES (2005 to 2016)

From 2005 to 2016, most communities witnessed a decrease in under-15 prevalence, especially Amhara. However, there were some pockets with increases.

Change in the Prevalence of Under-15 Child Marriage: 2005 to 2016



National Under-15 Prevalence

2005	2016
24.9%	12.9%

Percentage Point (pp) Change in Under-15 Prevalence from 2005 to 2016

- -25+ pp
- -25 pp to -10 pp
- -10 pp to -2 pp

Decrease

- -2 pp to 2 pp

- 2 pp to 10 pp
- 10 pp to 25 pp
- 25+ pp

Increase

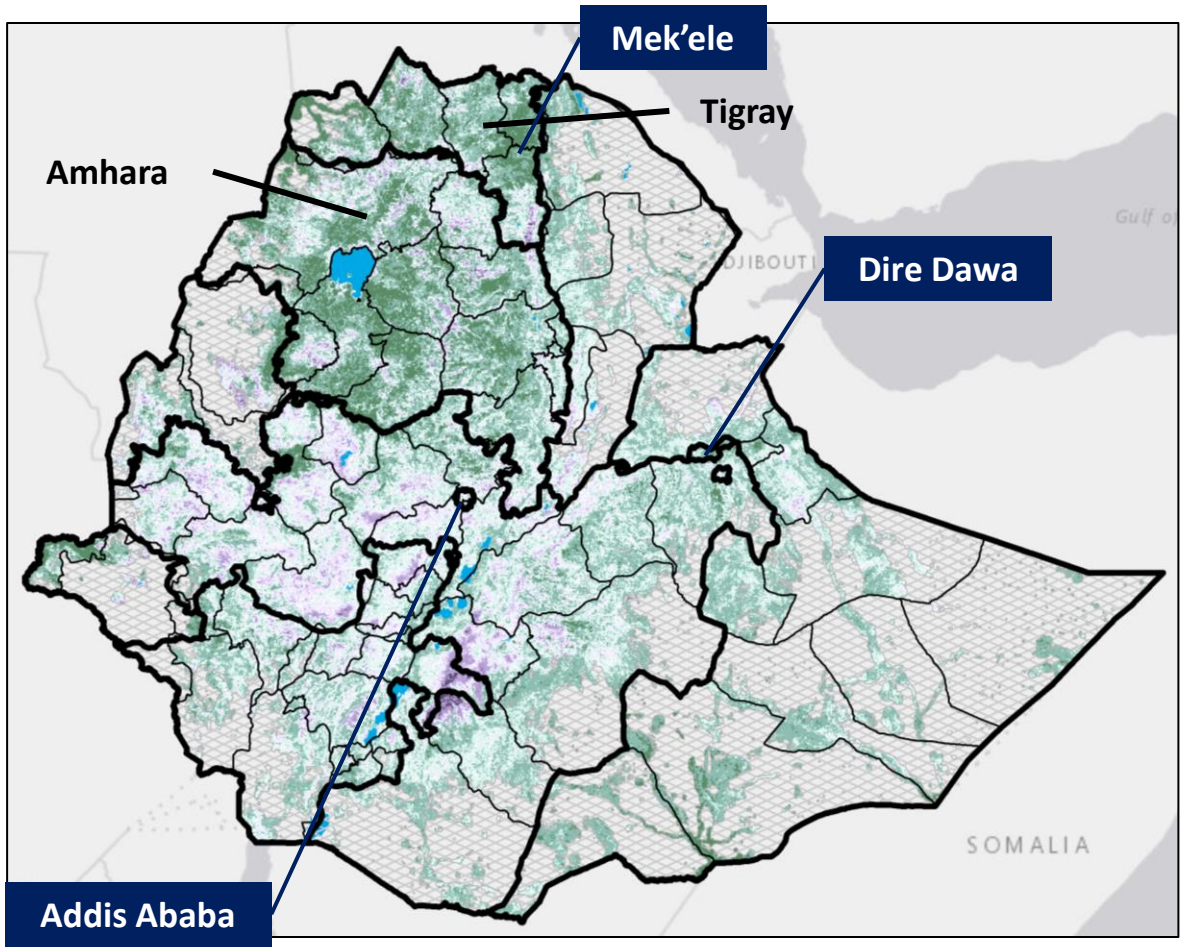
- Areas with total population less than 10 people per sq km
- Water bodies
- City Large cities

Source: Fraym, Ethiopia DHS (2011 and 2005)

MAPPING PREVALENCE AND BURDEN || UNDER-15 TIME SERIES INTERVAL (2005 to 2011)

In the first phase of analysis (2005 to 2011), most communities experienced a decrease in under-15 prevalence, especially in Amhara and Tigray.

Change in the Prevalence of Under-15 Child Marriage: 2005 to 2011



National Under-15 Prevalence

2005	2011
24.9%	16.8%

Percentage Point (pp) Change in Under-15 Prevalence from 2005 to 2011

- -25+ pp
- -25 pp to -10 pp
- -10 pp to -2 pp

Decrease

- -2 pp to 2 pp

- 2 pp to 10 pp
- 10 pp to 25 pp
- 25+ pp

Increase

Areas with total population less than 10 people per sq km

Water bodies

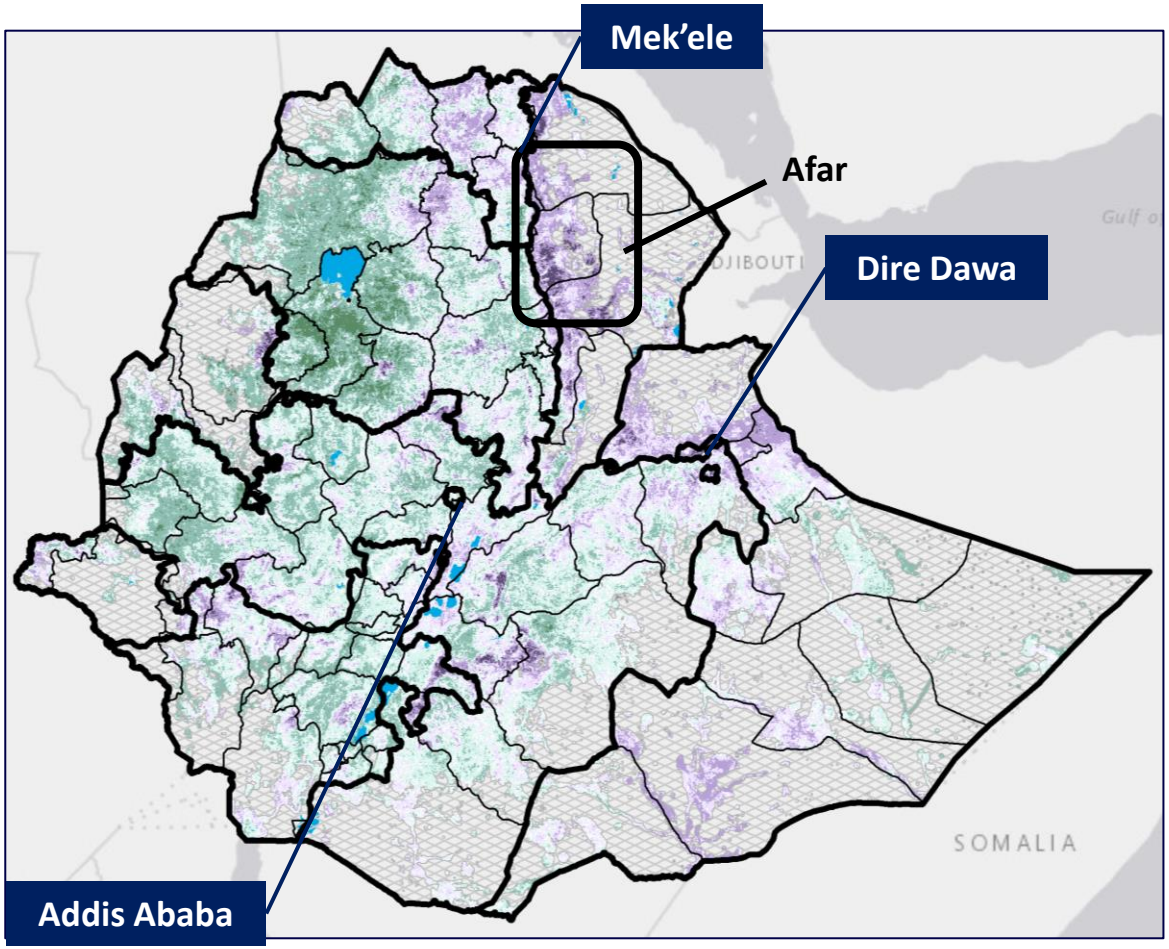
City Large cities

fraym **Source:** Fraym, Ethiopia DHS (2011 and 2005)

MAPPING PREVALENCE AND BURDEN || UNDER-15 TIME SERIES INTERVAL (2011 to 2016)

Across Ethiopia, the prevalence of under-15 child marriage declined from 2011 to 2016. However, prevalence has increased most notably in Afar.

Change in the Prevalence of Under-15 Child Marriage: 2011 to 2016



National Under-15 Prevalence

2011	2016
16.8%	12.9%

Percentage Point (pp) Change in Under-15 Prevalence from 2011 to 2016

- -25+ pp
- -25 pp to -10 pp
- -10 pp to -2 pp

Decrease

- -2 pp to 2 pp

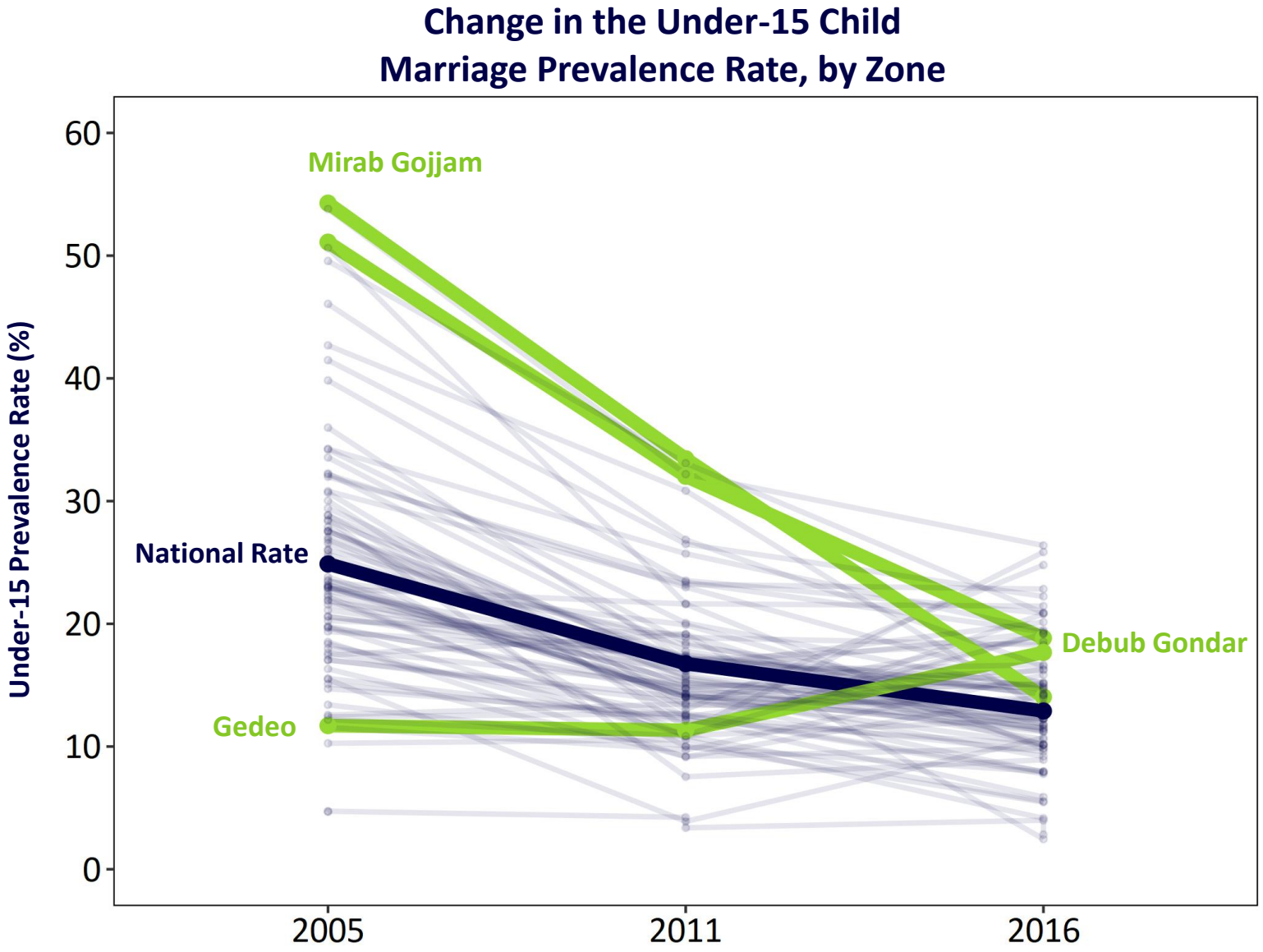
- 2 pp to 10 pp
- 10 pp to 25 pp
- 25+ pp

Increase

- Areas with total population less than 10 people per sq km
- Water bodies
- City — Large cities

Source: Fraym, Ethiopia DHS (2016 and 2011)

Broadly, zonal rates of under-15 child marriage decreased between 2005 and 2016. Mirab Gojjam and Debub Gondar experienced particularly large decreases, whereas Gedeo experienced a small increase.



Source: Fraym, Ethiopia DHS (2016, 2011, and 2005)

MAPPING PREVALENCE AND BURDEN || ZONES WITH LARGEST INCREASE/DECREASE

There were 6 zones with *increases* in under-15 prevalence between 2005 and 2016, while 73 zones achieved *decreases,* 48 of which were double-digit decreases.[1]

Largest Percentage Point Increase in Under-15 Prevalence (2005 to 2016)	
Gedeo (SNNPR)	+ 6 pp
Harari (Harari)	+ 4 pp
Afar Zone 4 (Afar)	+ 4 pp
Afar Zone 5 (Afar)	+ 2 pp
Afar Zone 1 (Afar)	+ 1 pp
Siti (Somali)	+ 1 pp

Largest Percentage Point Decrease in Under-15 Prevalence (2005 to 2016)	
Mirab Gojjam (Amhara)	- 40 pp
Debub Gondar (Amhara)	- 32 pp
Agew Awi (Amhara)	- 30 pp
Misraq Gojjam (Amhara)	- 30 pp
Nuer (Gambela)	- 29 pp
Semen Gondar (Amhara)	- 29 pp
Mi'irabawi (Tigray)	- 27 pp
Doolo (Somali)	- 21 pp
Semen Wello (Amhara)	- 20 pp
Metekel (Benishangul-Gumuz)	- 20 pp

Note 1: Fraym calculated the percentage point (pp) difference between 2005 and 2016 to determine whether a zone witnessed an increase or decrease in under-15 prevalence. In the tables above, the region is listed in parentheses. The SNNPR region is the Southern Nations, Nationalities, and People's Region.
Source: Fraym, Ethiopia DHS (2016, 2005)

MAPPING PREVALENCE AND BURDEN || KEY TAKEAWAYS

Both under-18 and under-15 prevalence rates changed substantially over time. Improvements were widespread, and most notably concentrated in Amhara.

1. In 2016, the national under-18 prevalence rate was 41 percent. An estimated 1.7 million women (aged 20-24) were married before age 18.

2. From 2005 to 2016, the under-18 prevalence rate decreased from 52 percent to 41 percent. **Sub-national spatiotemporal analysis indicates that the decrease was widespread, most notably in Amhara, and the largest decreases occurred between 2005 and 2011.**

3. Nationally, the under-15 prevalence rate was 13 percent in 2016. The under-15 burden was roughly 546,000 women (aged 20-24).

4. The under-15 prevalence rate at the national level has decreased 12 percentage points from 2005 to 2016. **Sub-nationally, 90 percent of zones witnessed decreases in the under-15 prevalence rate during this period.**

5. **Mirab Gojjam in Amhara experienced notable improvements with both the largest decrease in under-18 and under-15 prevalence.** Agew Awi, another zone in Amhara, also experienced notable decreases in under-18 and under-15 prevalence.

Community Characteristics

COMMUNITY CHARACTERISTICS || SECTION OVERVIEW

Fraym assessed a variety of indicators that help to illuminate community contexts and their relationship with child marriage prevalence.[1]

1. First, Fraym **developed a list of indicators based on feedback and discussion with child marriage experts**. Broadly, indicators capture socioeconomic characteristics and access to services.

2. More specifically, **target community-level indicators include traditionally child-marriage specific factors** such as employment and education, as well as less explored factors, such as access to electricity or improved sanitation at home.

3. Fraym produced **hyperlocal maps of each indicator** in order to identify communities with high concentrations of these indicators.

4. Fraym also analyzed the **relationship between under-18 prevalence and each indicator at the zone level.** The analysis assesses the relationship visually as well as through the calculation of the correlation coefficient. [2]

Note 1: For the remainder of this report, child marriage prevalence refers to under-18 prevalence unless otherwise noted.
Note 2: Analyses are bivariate and thus do not control for other factors.

COMMUNITY CHARACTERISTICS || METHODOLOGICAL OVERVIEW

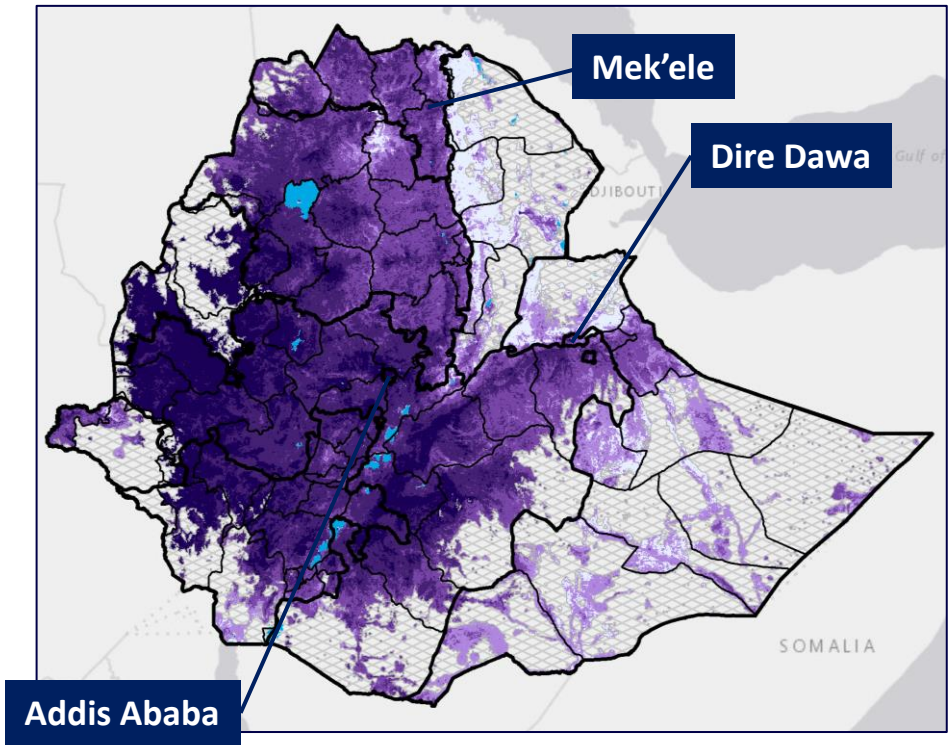
Fraym mapped a variety of community characteristics, then analyzed the statistical relationship with child marriage prevalence at the zone level.[1]

Socioeconomic Characteristics	
Adult Employment Adult Female Employment Educational Attainment by Sex	*Expected Relationship* = Areas with higher employment or educational attainment may have lower rates of child marriage prevalence.
Sexual and Reproductive Health	
Modern Contraceptive Prevalence	*Expected Relationship* = The relationship between contraceptive prevalence and child marriage is complicated given the close relationship between adolescent childbearing and child marriage.[2]
Health and Nutrition	
Child Stunting Health System Usage	*Expected Relationship* = 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.
Infrastructure	
Access to Electricity Access to Improved Sanitation	*Expected Relationship* = Areas with better infrastructure may have lower rates of child marriage prevalence.

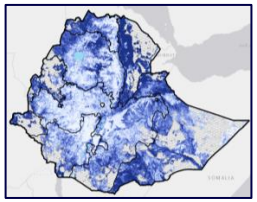
Note 1: Analyses are bivariate and thus do not control for other factors. Please see slides 29-37 and the appendix for indicator definitions.
Note 2: Increasing evidence suggests that many married adolescent girls report not using contraception due to a desire to become mothers. For example, see https://reproductive-health-journal.biomedcentral.com/articles/10.1186/s12978-019-0686-9

Zones with higher child marriage prevalence rates tend to have lower rates of adult employment.

Adult Employment at the Community Level



Percent of adults (aged 15-49) that are employed



0% 60%+

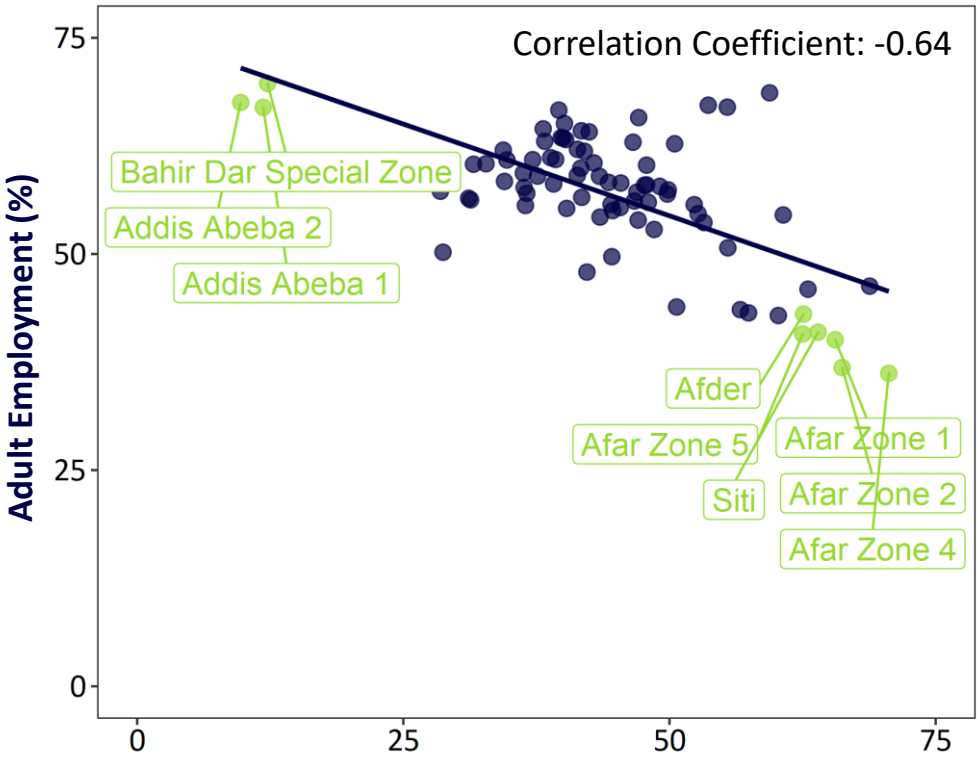
Under 18 Prevalence

City Large cities

Areas with total population less than 10 people per sq km

Adult Employment Rate and Child Marriage Prevalence

Each point represents a zone.



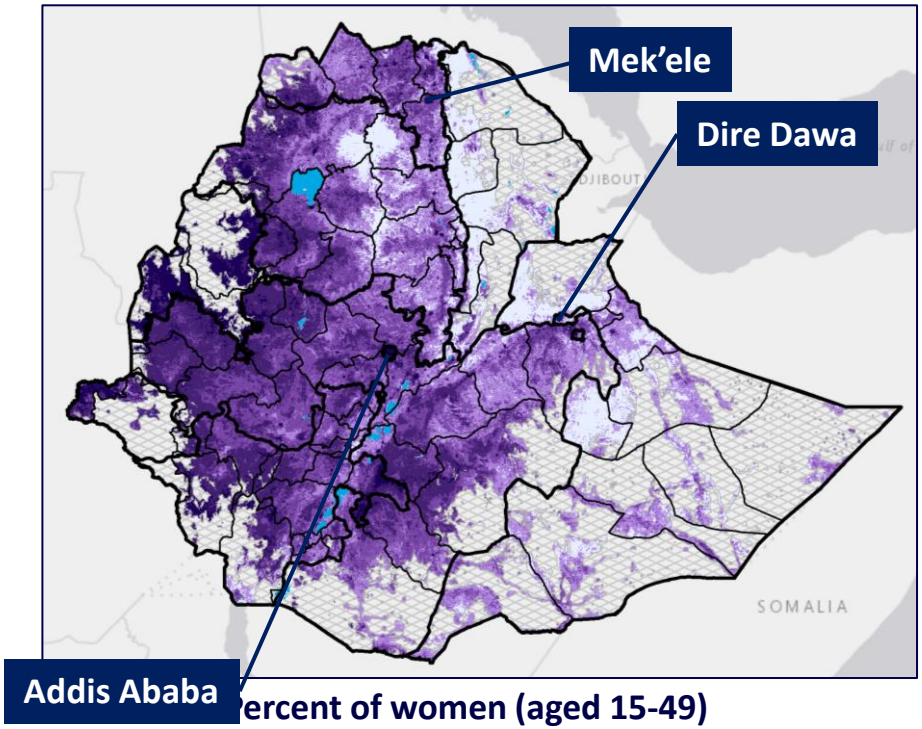
Under-18 Prevalence (%)

The y-axis intervals vary across indicators depending on the range of the values.

fraym **Source:** Fraym, Ethiopia DHS 2016

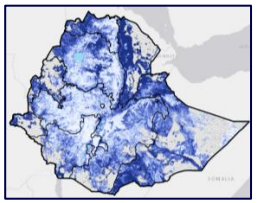
As with overall employment, female employment is negatively correlated with child marriage prevalence, meaning zones with high prevalence have low employment.

Adult Female Employment at the Community Level



ercent of women (aged 15-49) that are employed

0% 40%+



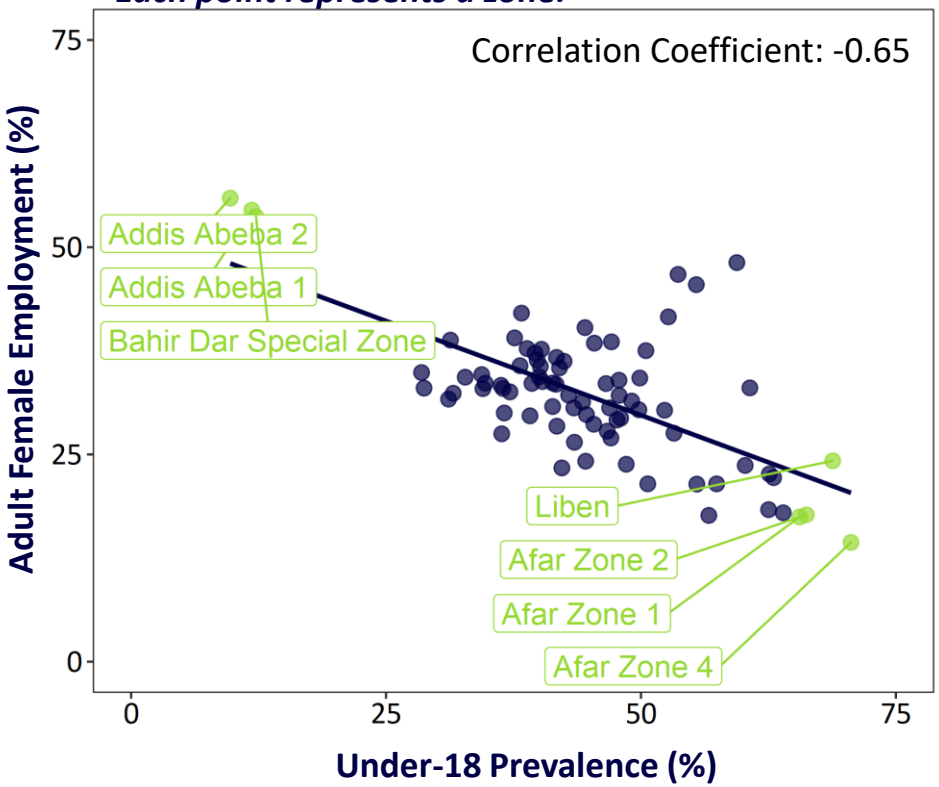
Under 18 Prevalence

City Large cities

Areas with total population less than 10 people per sq km

Adult Female Employment Rate and Child Marriage Prevalence

Each point represents a zone.



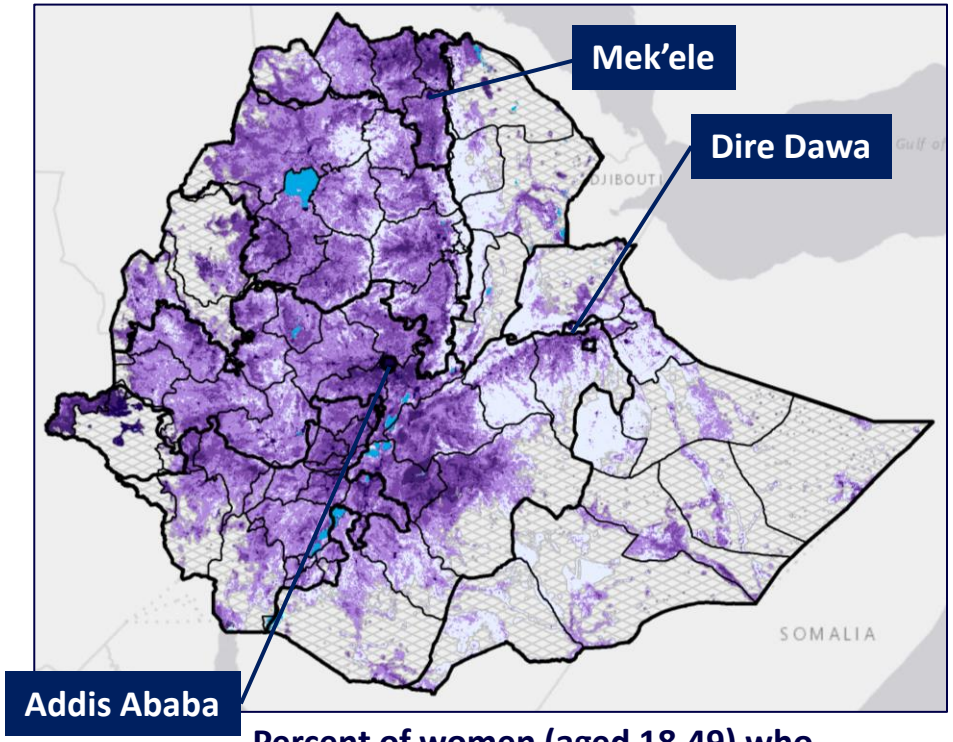
The y-axis intervals vary across indicators depending on the range of the values.

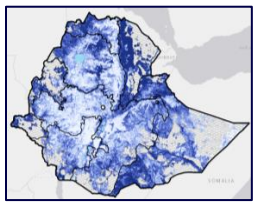
fraym

Source: Fraym, Ethiopia DHS 2016

The relationship between child marriage prevalence and women's educational attainment shows a strong, negative relationship, suggesting that there are lower child marriage rates in zones where women have higher educational attainment.

Female Educational Attainment at the Community Level





Percent of women (aged 18-49) who completed primary school or higher

0% 35%+

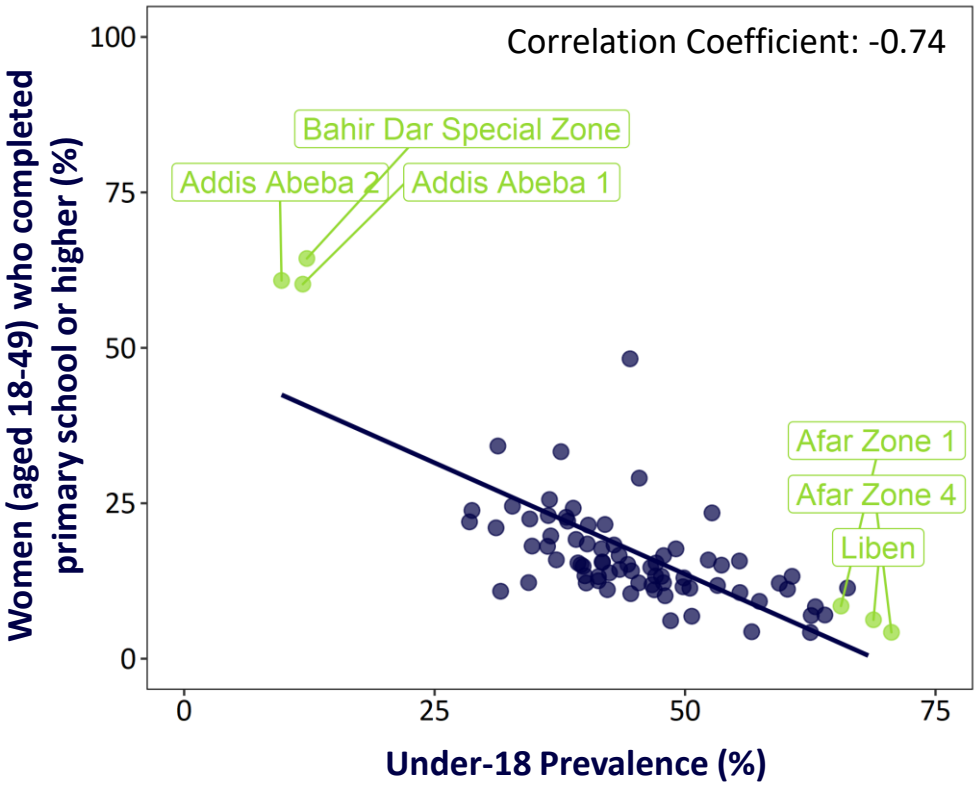
Under 18 Prevalence

City Large cities

Areas with total population less than 10 people per sq km

Female Educational Attainment and Child Marriage Prevalence

Each point represents a zone.



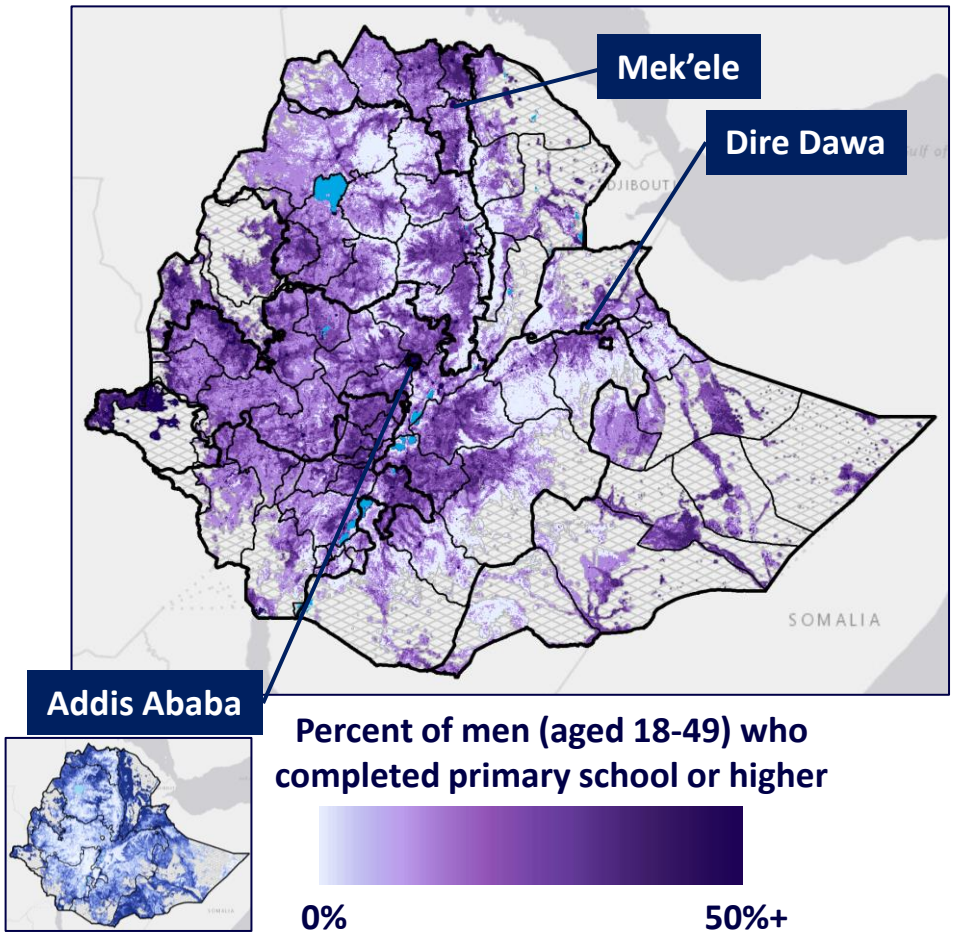
The y-axis intervals vary across indicators depending on the range of the values.

fraym

Source: Fraym, Ethiopia DHS 2016

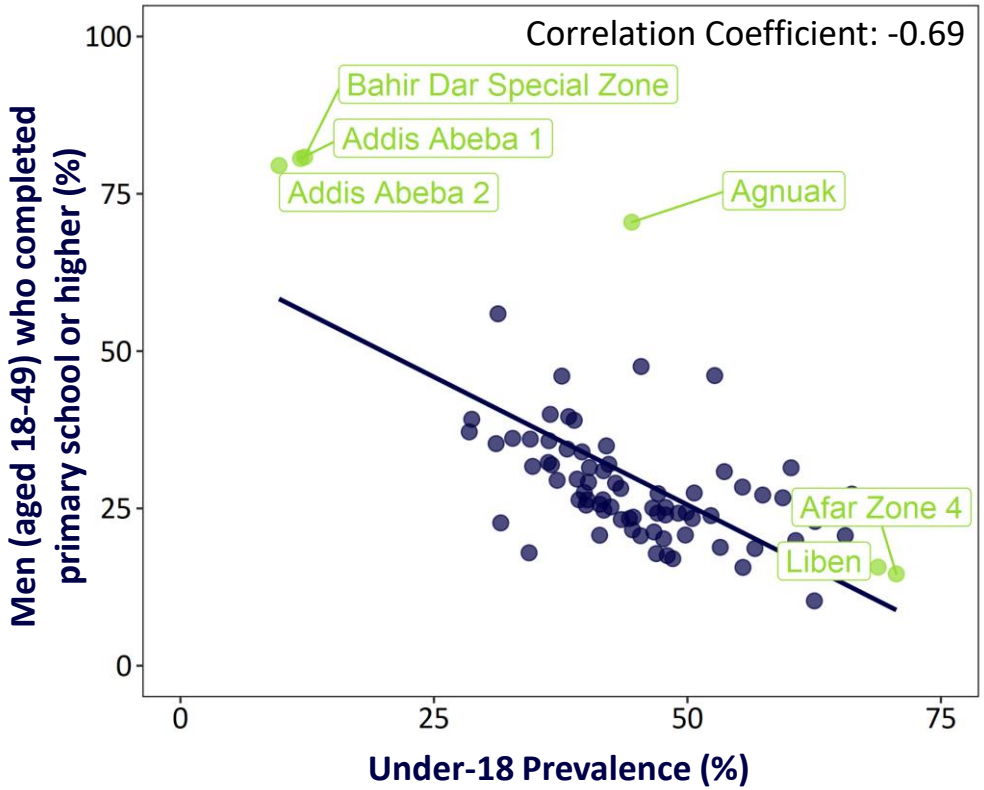
As with female education, there is a strong, negative relationship with male education and child marriage prevalence, suggesting that there are lower child marriage rates in zones where men have higher educational attainment.

Male Educational Attainment at the Community Level



Male Educational Attainment and Child Marriage Prevalence

Each point represents a zone.

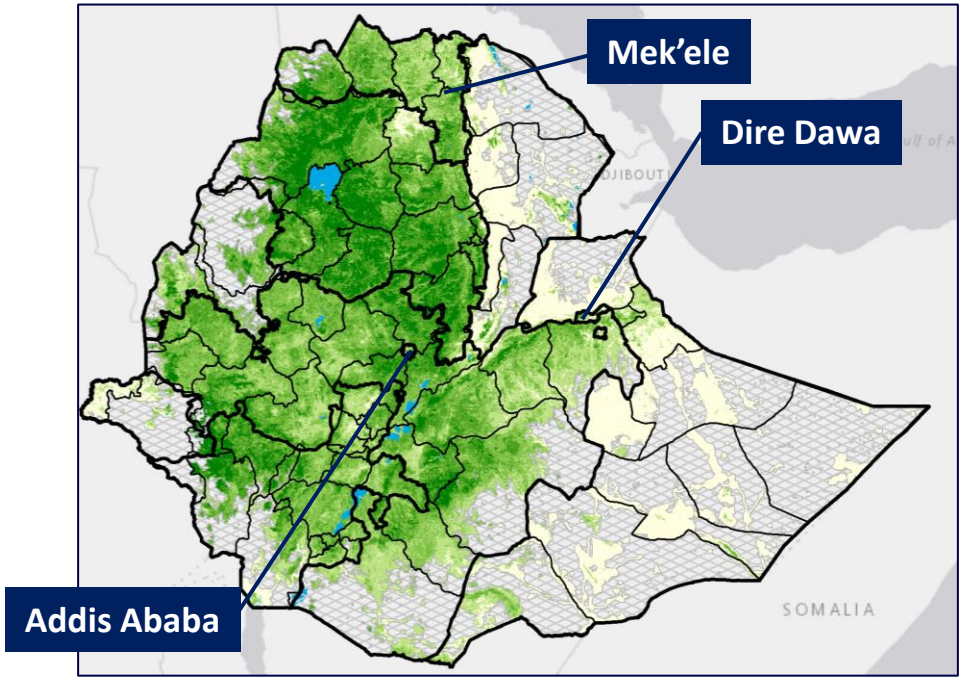


The y-axis intervals vary across indicators depending on the range of the values.

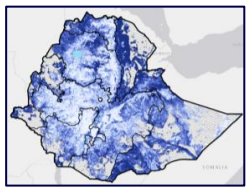
Source: Fraym, Ethiopia DHS 2016

There is a modest correlation between higher child marriage prevalence and lower rates of modern contraceptive use, suggesting that child marriage rates are typically lower in zones where modern contraceptive use is higher.[1]

Modern Contraceptive Use at the Community Level



Percent of women (aged 15-24) who are sexually active and use a modern contraceptive method



Under 18 Prevalence

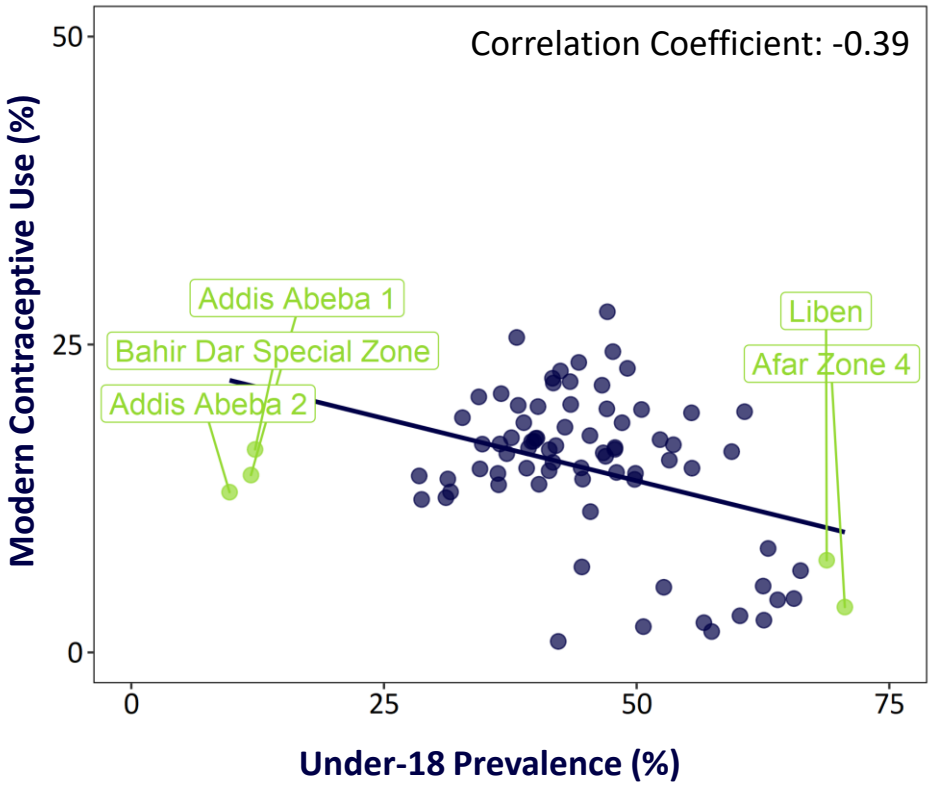
0% **24%+**

City Large cities

Areas with total population less than 10 people per sq km

Modern Contraceptive Use and Child Marriage Prevalence

Each point represents a zone.



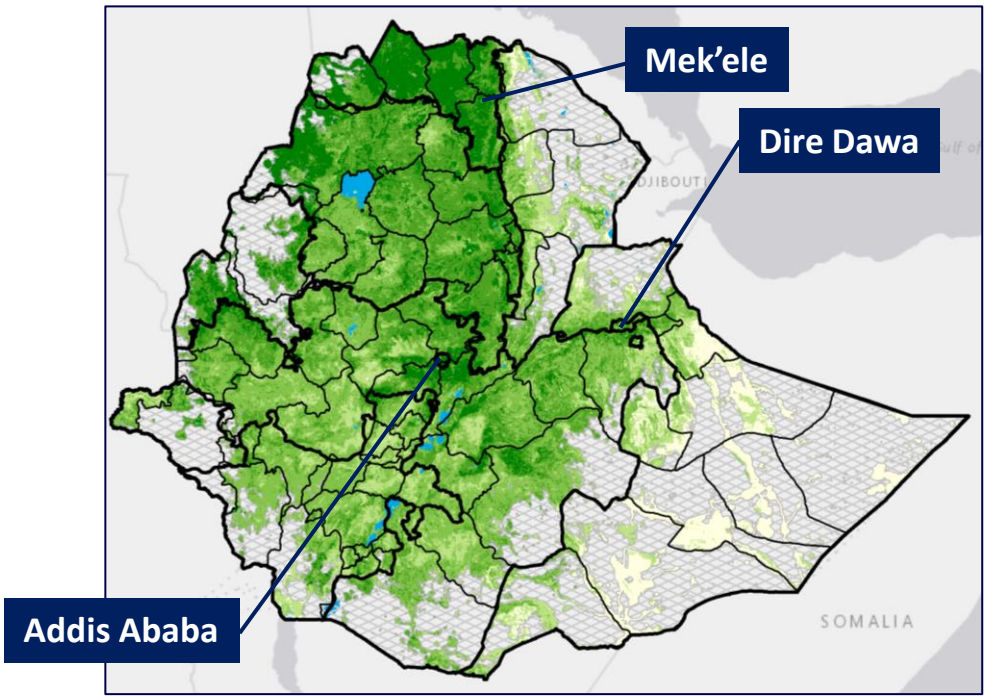
The y-axis intervals vary across indicators depending on the range of the values.

Note 1: Modern contraceptive prevalence is defined using the DHS definition, that is the percent of women (aged 15-24) that use a modern method. Modern methods exclude periodic abstinence and withdrawal, which are considered traditional methods.

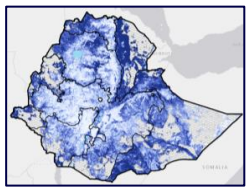
Source: Fraym, Ethiopia DHS 2016

There also is a modest negative correlation between child marriage prevalence and health system usage.[1]

Health System Usage at the Community Level



Percent of women (aged 15-49) who use the health system



0% **60%+**

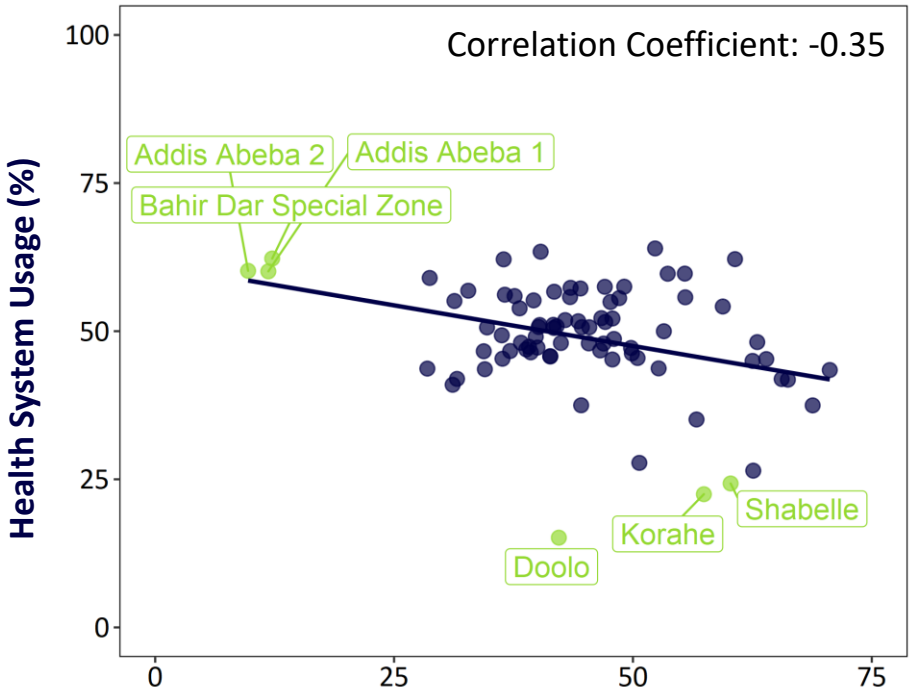
Under 18 Prevalence

City Large cities

Areas with total population less than 10 people per sq km

Health System Usage and Child Marriage Prevalence

Each point represents a zone.



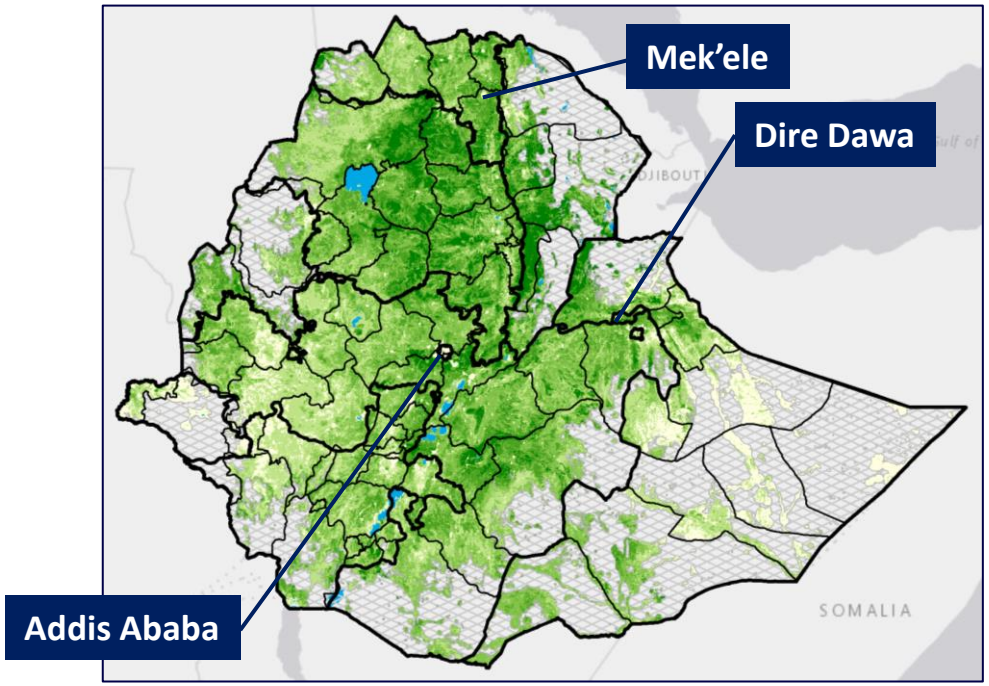
The y-axis intervals vary across indicators depending on the range of the values.

Note 1: Health system usage is defined as women (ages 15-49) who have visited a health facility or have been visited by a fieldworker to talk about family planning in the past 12 months.

Source: Fraym, Ethiopia DHS 2016

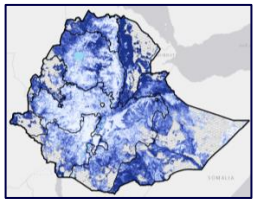
Zones with high child marriage prevalence tend to have high rates of child stunting.

Child Stunting at the Community Level



Percent of children under five who are stunted

0% 50%+



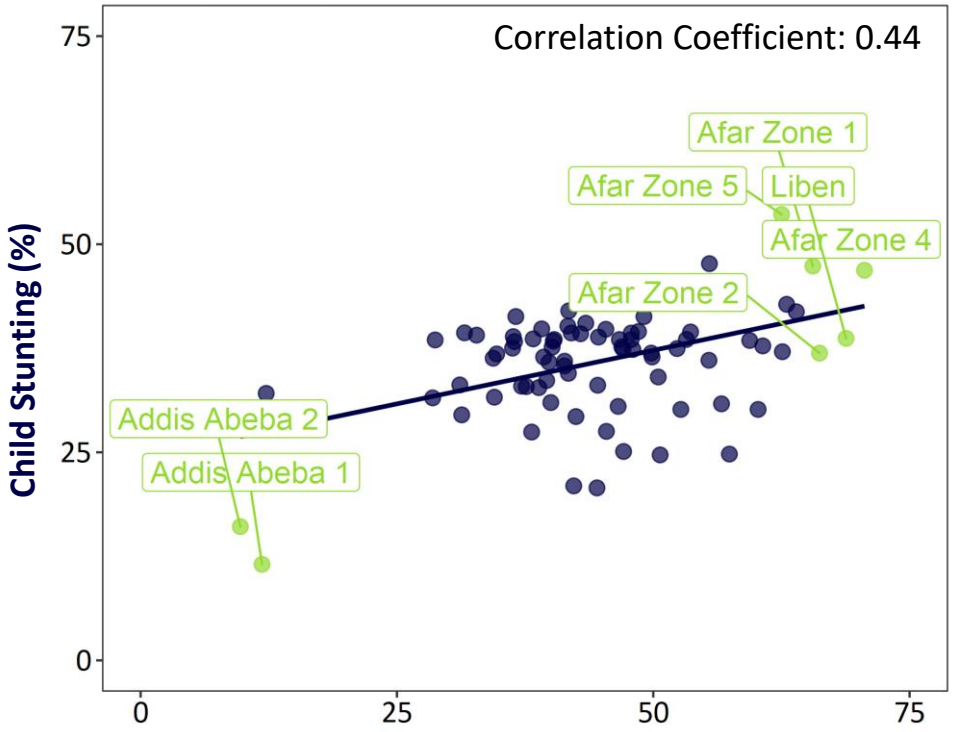
Under 18 Prevalence

City Large cities

Areas with total population less than 10 people per sq km

Child Stunting and Child Marriage Prevalence

Each point represents a zone.



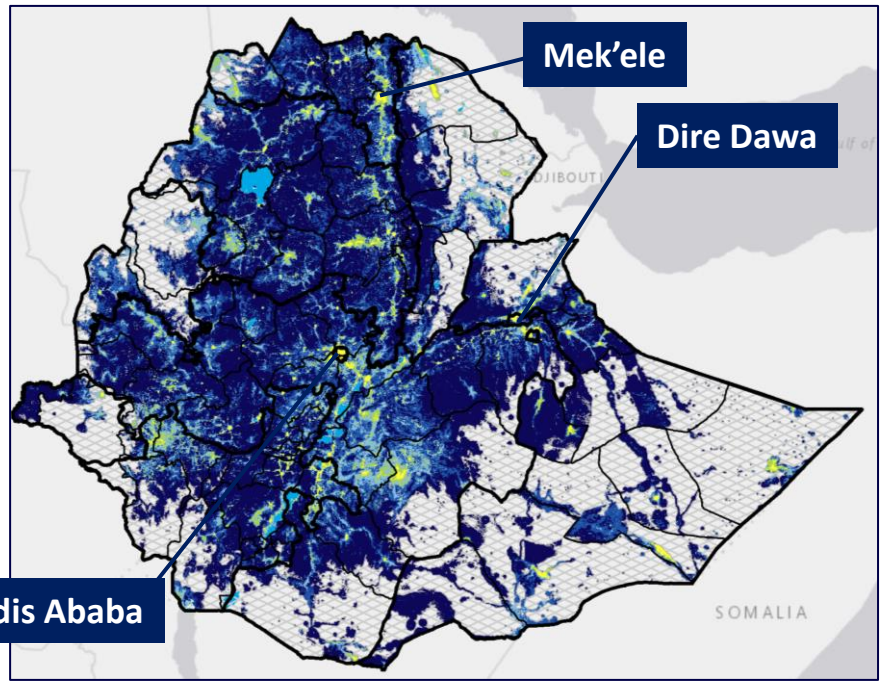
Under-18 Prevalence (%)

The y-axis intervals vary across indicators depending on the range of the values.

fraym **Source:** Fraym, Ethiopia DHS 2016

Zones with high child marriage prevalence tend to have low rates of electricity access.[1] The magnitude of the correlation coefficient indicates a strong relationship.

Access to Electricity at the Community Level

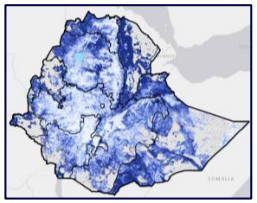


Percent of individuals that live in households with access to electricity

0% 60%+

City Large cities

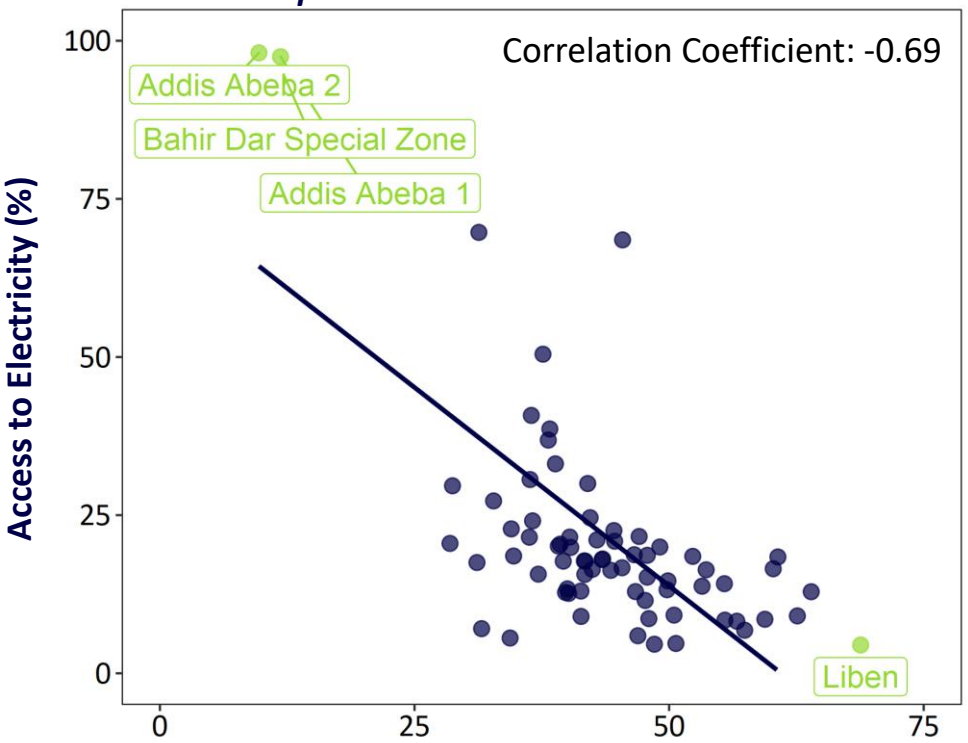
Areas with total population less than 10 people per sq km



Under 18 Prevalence

Access to Electricity and Child Marriage Prevalence

Each dot represents a zone.



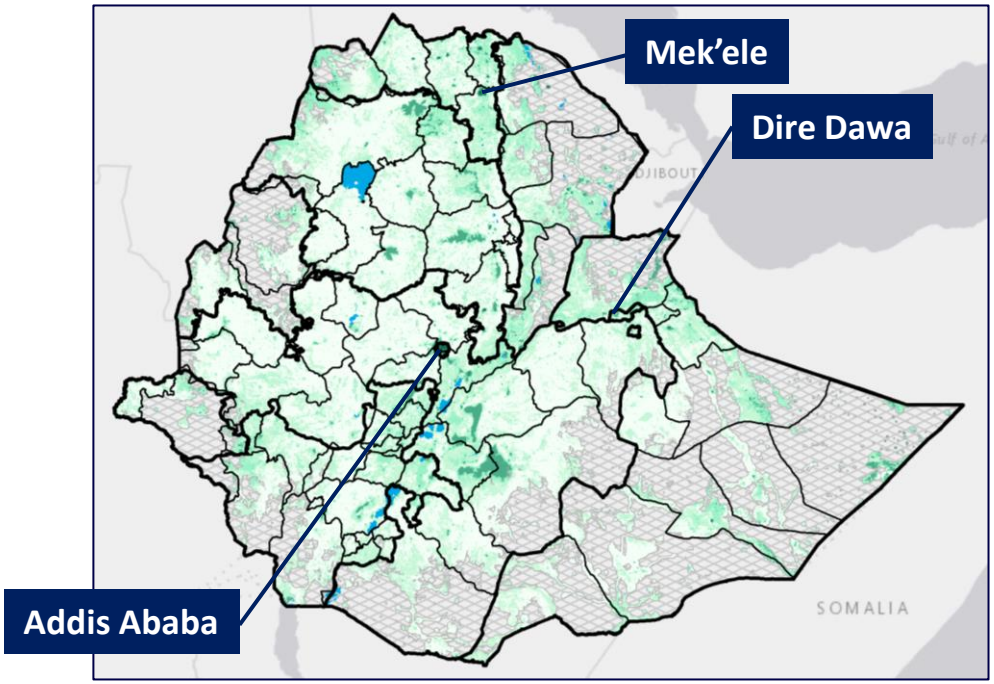
The y-axis intervals vary across indicators depending on the range of the values.

Note 1: Modeled estimates at the sq km level for Afar and Gambela do not meet Fraym quality standards. As a result, estimates in these regions should be considered as less precise and interpreted with caution. Zones within these regions are excluded from the scatter plot.

Source: Fraym, Ethiopia DHS 2016

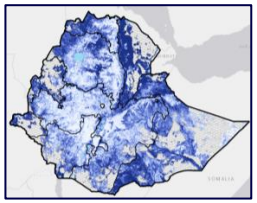
Most zones in Ethiopia have very limited access to improved sanitation, as measured by flush toilet access, regardless of child marriage prevalence rates.

Flush Toilet Access at the Community Level



Percent of individuals that live in households with a flush toilet

0% — 20%+



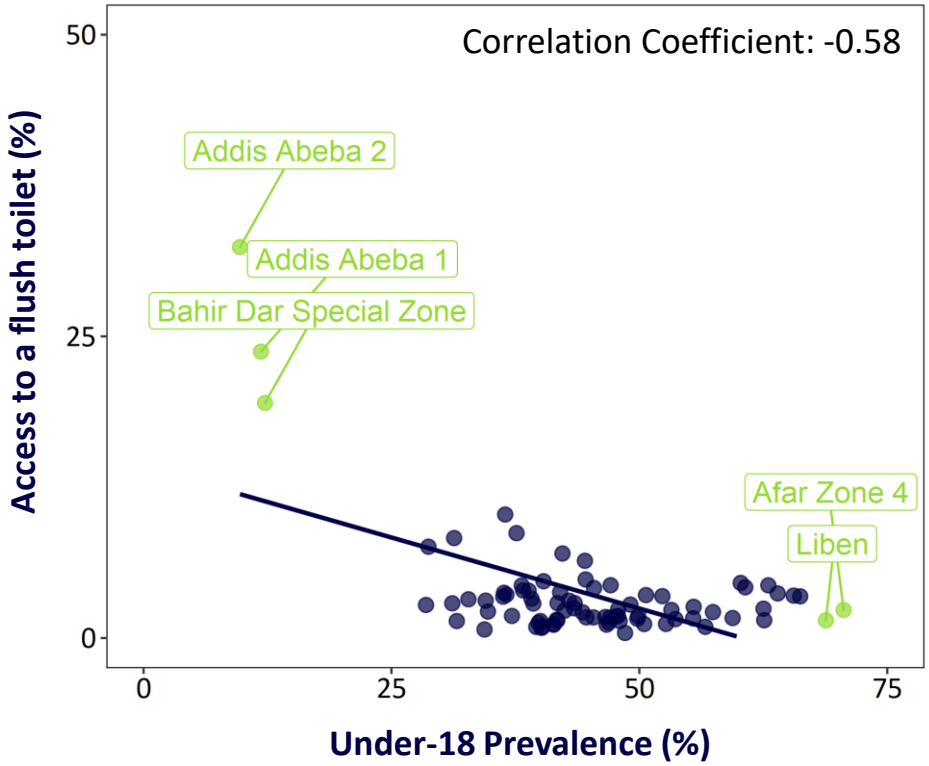
Under 18 Prevalence

City Large cities

Areas with total population less than 10 people per sq km

Flush Toilet Access and Child Marriage Prevalence

Each dot represents a zone.



The y-axis intervals vary across indicators depending on the range of the values.

fraym

Source: Fraym, Ethiopia DHS 2016

COMMUNITY CHARACTERISTICS || KEY TAKEAWAYS

The direction and magnitude of the correlation coefficient between various community indicators and child marriage is largely as expected.

1. Both **male and female educational attainment are most strongly associated with under-18 child marriage**. The direction of the relationship is negative.

2. The correlation coefficient between health system usage and child marriage prevalence is the smallest magnitude across the examined characteristics, which indicates a weak relationship.

3. Even indicators that are **not traditionally considered in the child marriage literature, such as access to electricity or flush toilets, have a strong negative relationship** with child marriage prevalence.

Correlation Coefficient with Child Marriage Prevalence at the Zone Level	
Socioeconomic Characteristics	
Adult Employment	-0.65
Female Employment	-0.65
Female Educational Attainment	-0.74
Male Educational Attainment	-0.69
Health	
Modern Contraceptive Use	-0.39
Health System Usage	-0.35
Child Stunting	0.45
Infrastructure	
Access to Electricity	-0.69
Access to Improved Sanitation	-0.58

Source: Fraym

At-Risk Population

AT-RISK POPULATION || SECTION OVERVIEW

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-equitable attitudes and behaviors.

1. Based on a summary of the literature and expert consultation, Fraym **examined relevant indicators to identify the three potential risk factors**, and then mapped the presence of these risk factors across Ethiopia.

2. Fraym then **estimated the potential risk profiles at the community level (1 km^2) and categorized communities** as low-, medium-low, medium-high, or high risk based upon the national distribution (e.g., quartiles).

3. Next, Fraym **estimated the at-risk population of girls aged 10 to 14 by isolating the high risk areas** across each of the three risk profiles and calculating the total number of girls aged 10 to 14 that live in those communities.

4. Finally, Fraym looked at the relationship between child marriage prevalence and risk factor profiles to better **assess whether high-risk areas are also high prevalence areas**.

5. Identifying areas where young girls are at risk of child marriage can help decision-makers better target program, policy, and advocacy efforts.

AT-RISK POPULATION || PREGNANCY & CHILD MARRIAGE (ANALYTIC FRAMEWORK)

Literature suggests that pregnancy among young women and child marriage are linked, although it is difficult to disentangle the directionality.

1. Pregnancy among young women in Ethiopia is relatively high – 32 percent of women aged 15 to 24 have given birth, regardless of marital status.

2. Birth before marriage is very uncommon in Ethiopia. Only one percent of never-married women aged 15 to 24 have given birth. This low proportion suggests that most births occur within marriage.

3. To assess the relationship between pregnancy and child marriage, Fraym isolated pregnancy occurring outside of marriage by focusing on ever-married women who gave birth either anytime before marriage or up until six months after marriage. This framing assumes that the woman knew that she was pregnant prior to marriage and may have decided to get married as a result of the pregnancy.

Women who have given birth, by age group and marital status (%)			
	Aged 20-24	Aged 15-19	Aged 15-24
All women	57%	11%	32%
Ever-married women[1]	79%	45%	69%
Never-married women[2]	-	-	1%

Note 1: Ever-married women include women who are currently married, living with a partner, widowed, divorced, or are no longer living together. Fraym also looked at currently married women only and found the proportions across age groups to be similar to ever-married women.
Note 2: Proportions of never-married women who gave birth in the 20-24 age range and 15-19 age range are excluded due to sample size.
Source: Fraym, Ethiopia DHS 2016

Pregnancy outside of marriage is an unlikely risk factor for child marriage in Ethiopia.

1 Only five percent of ever-married women aged 15-24 have given birth outside of marriage. In fact, the average interval between marriage and first birth among this cohort is 27 months.[1] Together, these figures suggest that pregnancy outside of marriage is uncommon.

2 If pregnancy outside of marriage was a strong risk factor for child marriage, we would expect a high proportion of women married before age 18 to have given birth outside of marriage. However, only five percent of women aged 20-24 who were married before age 18 gave birth before or within six months of marriage.

Women who have given birth before or within six months of marriage, by age group and marital status (%)			
	Aged 20-24	Aged 15-19	Aged 15-24
All women[2]	4%	-	2%
Ever-married women[2,3]	6%	-	5%
Women who were married before age 18	5%	-	-

Note 1: The average interval between marriage and first birth excludes women who gave birth before marriage. The DHS does not report the number of months for negative intervals.
Note 2: Proportions of women who have given birth before or within six months of marriage in the 15-19 age range are excluded due to sample size.
Note 3: Ever-married women include women who are currently married, living with a partner, widowed, divorced, or are no longer living together. Fraym also looked at currently married women only and found the proportions across age groups to be similar to ever-married women.
Source: Fraym, Ethiopia DHS 2016

AT-RISK POPULATION || POVERTY AND CHILD MARRIAGE (ANALYTIC FRAMEWORK)

Literature suggests a strong relationship between poverty and child marriage. Based on expert consultation, Fraym measured poverty through education, employment, and overall wealth.[1]

1 **Education:** 85 percent of household heads with a daughter in the household have completed primary school or have no education.

2 **Employment:** Most household heads with daughters are employed, and more than three-quarters of those employed work in unskilled manual labor or are self-employed in agriculture.[2] Among women aged 15-24, about a quarter are employed, and of those employed, a 33 percent work in unskilled manual labor or are self-employed in agriculture.

Poverty-related Indicators	
Education	
Household heads with daughters, and who have primary schooling or less	85%
Employment	
Household heads with daughters, and who are employed	87%
Household heads with daughters, and who are working in unskilled manual labor or self-employed in agriculture	78%
Women (aged 15-24) who are employed	26%
Employed women (aged 15-24) working in unskilled manual labor or self-employed in agriculture	33%

Note 1: Risk profile indicators, particularly wealth, are explained in more detail in the appendix.
Note 2: Based on expert consultations, Fraym identified employment in unskilled manual labor or self-employment in agriculture as low opportunity jobs, or jobs that are likely to have low pay and/or poor working conditions.
Source: Fraym, Ethiopia DHS 2016

AT-RISK POPULATION || POVERTY AND CHILD MARRIAGE (NATIONAL CONTEXT)

In Ethiopia, employed women who were married as children are more likely to work in unskilled manual labor or self-employed in agriculture compared to all employed women. Furthermore, women married by age 18 are more likely to be in the lower wealth quintiles.

Employment indicators for women aged 20-24

Indicator	Women (aged 20-24)	Women (aged 20-24) who were married before age 18
Women who are employed	30%	22%
Employed women working in unskilled manual labor or self-employed in agriculture[2]	30%	48%

Distribution of women aged 20-24 by wealth quintile and under-18 prevalence[1]

Note 1: The wealth index is a standard DHS variable. It is a composite measure of a household's cumulative living standard, calculated using information on household asset ownership, housing materials, and access to water and sanitation services. The first quintile is the poorest while the fifth quintile is the wealthiest.

Note 2: Based on expert consultations, Fraym identified employment in unskilled manual labor or self-employment in agriculture as low opportunity jobs, or jobs that are likely to have low pay and/or poor working conditions.

Source: Fraym, Ethiopia DHS 2016

AT-RISK POPULATION || POVERTY & CHILD MARRIAGE (RISK PROFILE CONSTRUCTION)

The poverty risk profile reflects a given community's wealth, employment and education levels, which are calculated using principal component analysis.

1. Based on feedback and analysis, Fraym **selected four indicators to capture poverty**: (i) wealth; (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.

2. Fraym **combined the indicators into a poverty risk profile index using principal component analysis (PCA)** and estimated the index scores at the community level (1 km^2).

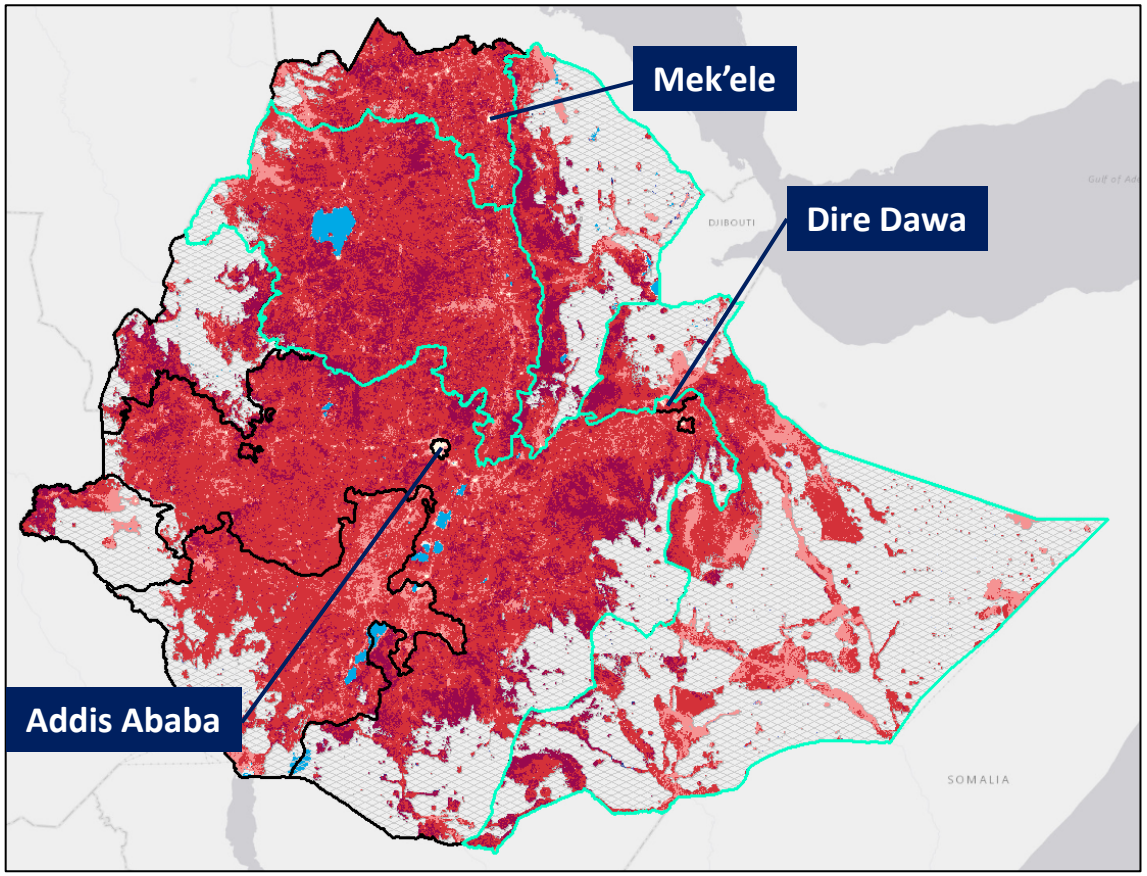
3. Fraym then **classified communities into quartiles with risk categories ranging from 1 to 4.** Communities with higher index values, or more impoverished as defined by the index, are categorized as a 4 ("high risk").

4. Finally, Fraym **estimates the number of at-risk girls** by calculating the total number of girls aged 10 to 14 who live in the communities where poverty represents the highest risk for child marriage (categorized as a 4).

AT-RISK POPULATION || POVERTY & CHILD MARRIAGE (RISK PROFILE MAPPING)

Communities in the highest quartile are classified as high-risk. There are an estimated 757,000 girls aged 10 to 14 who live in these communities where poverty represents a risk factor for child marriage.

Poverty Index Risk Category[1]



- Low Risk
- Medium-Low Risk
- Medium-High Risk
- High Risk
- Areas with total population less than 10 people per sq km
- Water bodies
- City — Large cities

Population of at-risk girls due to poverty, highlighted regions[2]

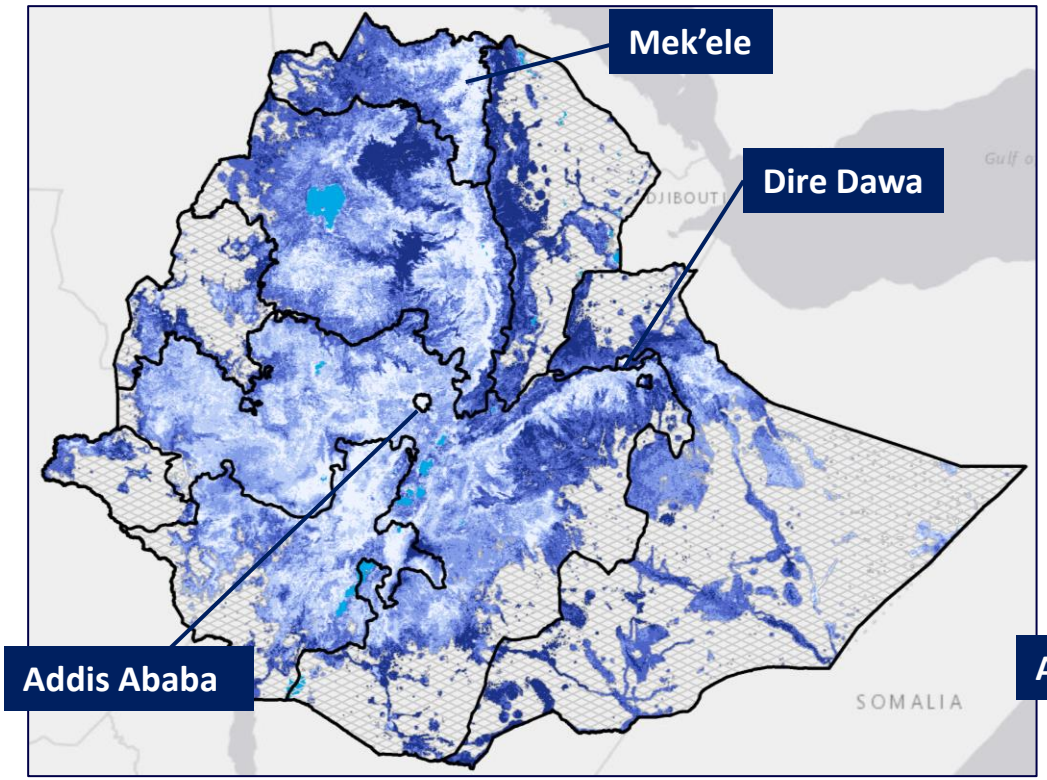
County	Population of at-risk girls (aged 10-14)
Afar	40,000
Somali	53,400
Amhara	279,000

Note 1: The map shows the classification of the poverty index for each 1km^2 cell into quartiles. The poverty index risk categories range on a 1 to 4 scale, with 4 indicating the highest level of risk. See slides 45 or the appendix for more details.
Note 2: At-risk girls are defined as girls at risk for child marriage, that is girls aged 10-14 who live in communities with a poverty index risk category equal to 4 (highest risk).
Source: Fraym, Ethiopia DHS 2016, WorldPop 2020

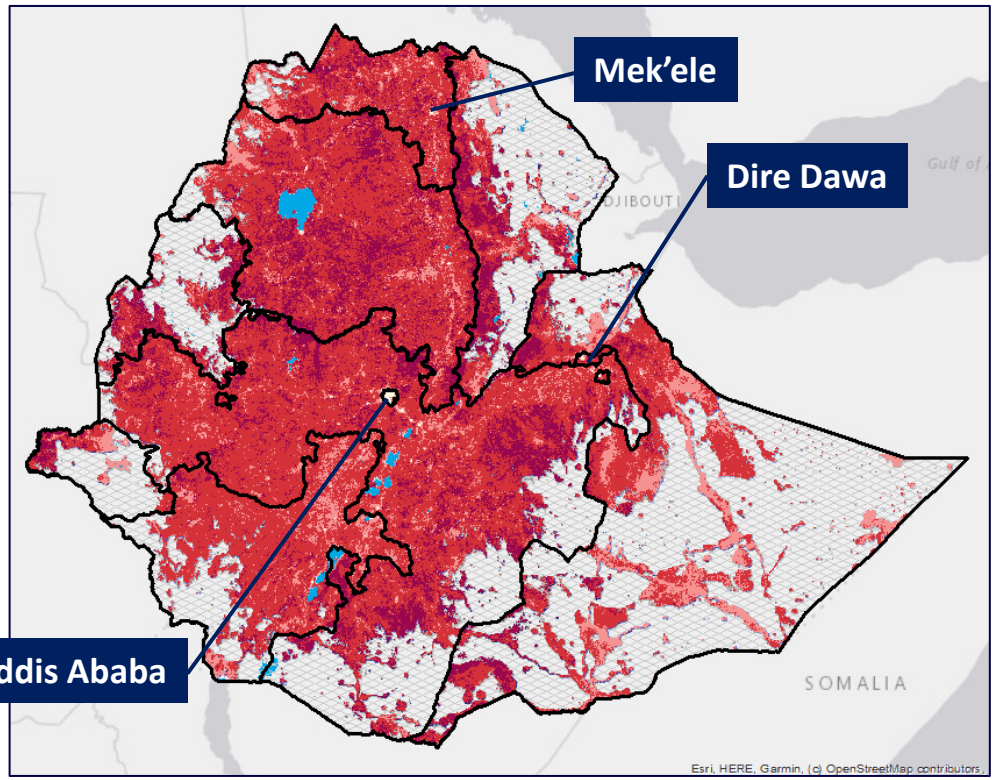
AT-RISK POPULATION || POVERTY & CHILD MARRIAGE (RISK PROFILE MAPPING)

Communities with high under-18 child marriage prevalence also are communities classified as high risk, indicating that poverty is a likely risk factor for child marriage.

Child Marriage Prevalence



Poverty Index Risk Category[1]



Percent of women (aged 20-24) who were married before 18

0% — **65%+**

Areas with total population less than 10 people per sq km

City Large cities

- Low Risk
- Medium-Low Risk
- Medium-High Risk
- High Risk

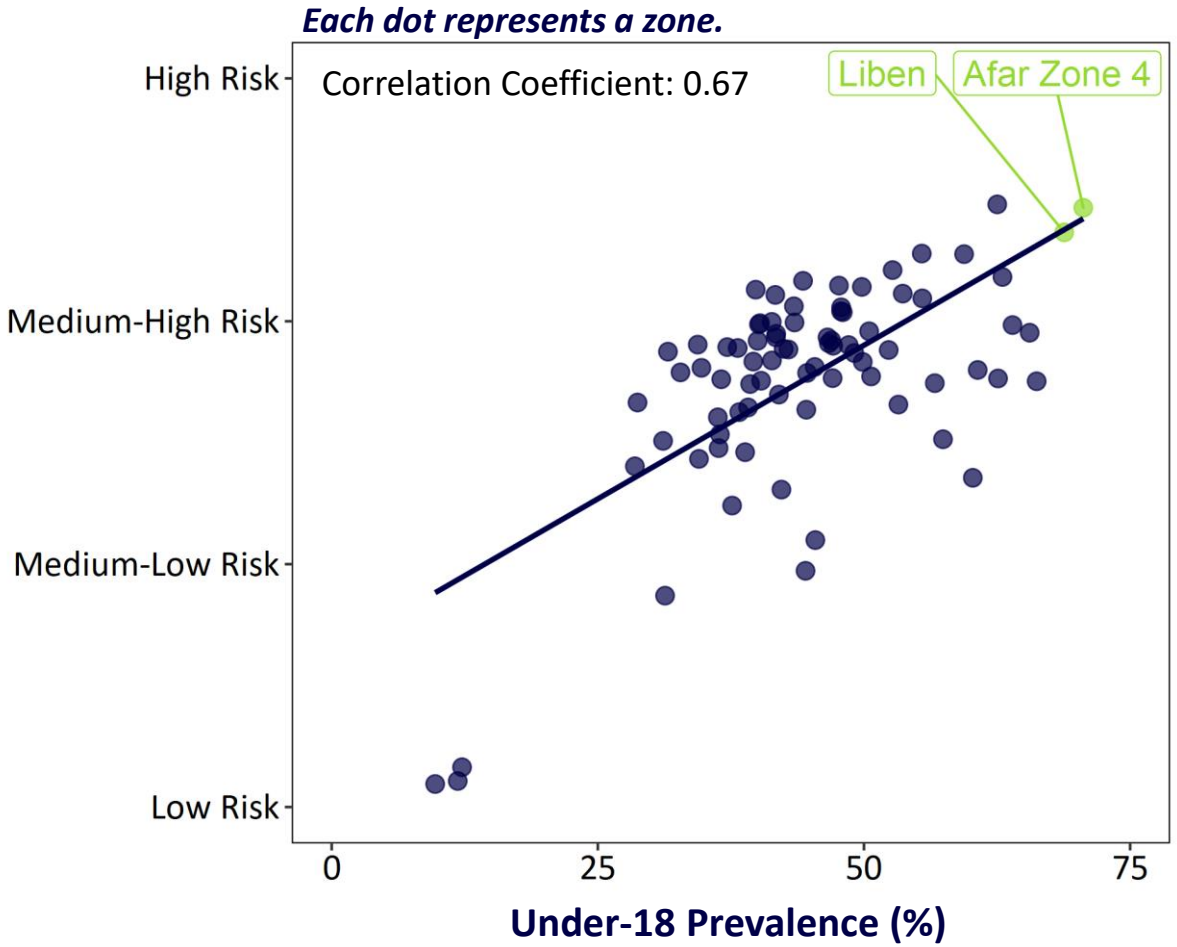
Note 1: The map shows the classification of the poverty index for each 1km^2 cell into quartiles. The poverty index risk categories range on a 1 to 4 scale, with 4 indicating the highest level of risk. See slide 45 or the appendix for more details.

Source: Fraym, Ethiopia DHS 2016, WorldPop 2020

AT-RISK POPULATION || POVERTY & CHILD MARRIAGE (RISK PROFILE MAPPING)

Zones with high child marriage prevalence tend to be classified as high-risk. The size of the correlation coefficient suggest a strong relationship, indicating that poverty is a likely risk factor for child marriage in Ethiopia.

Average Poverty Index Risk Category and Child Marriage Prevalence



Source: Fraym

Gender-equitable attitudes and behaviors may be associated with lower rates of child marriage.

1. To measure gender-equitable attitudes and behaviors, Fraym used attitudes towards domestic violence and women's participation in decision-making.

2. Attitudes towards domestic violence may be related to child marriage. Roughly one out of every four men and nearly two out of every three women (aged 15-49) believe that there are situations wherein it is justified for husbands to beat their wives.

3. Women's greater participation in decision making may imply empowerment, and thus may be related to lower rates of child marriage. In Ethiopia, most currently married women (aged 15-49) participate in household decisions.

Attitudes and behaviors, by sex	Women	Men
Domestic Violence		
Believe that there is at least one reason that justifies wife beating	63%	27%
Women's Participation in Decision Making[1]		
Respondent's healthcare	81%	-
Large household purchases	77%	-
Visits to family	83%	-
Husband's earnings	76%	-

Note 1: Women's participation in decision-making is defined as the woman reporting that she makes the decision on her own or jointly with her partner. Questions regarding decision making are only asked to currently married individuals. Currently married men were asked about decision making on their own healthcare and major household purchases, however these figures are excluded.
Source: Fraym, Ethiopia DHS 2016

AT-RISK POPULATION || ATTITUDES & CHILD MARRIAGE (RISK PROFILE CONSTRUCTION)

Communities where individuals agree that wife-beating is justified are more likely to have high child marriage prevalence rates.

1. Fraym examined the correlation between attitudes towards wife beating and child marriage prevalence at the community level.

2. Fraym then estimated the selected indicator at the community level (1 km^2) and classified communities into quartiles with risk categories ranging from 1 to 4. Communities with higher rates of affirming attitudes towards wife beating are categorized as a 4 ("high risk").

3. Finally, Fraym estimated the number of at-risk girls by calculating the total number of girls aged 10 to 14 who live in the communities where gender inequitable attitudes represents the highest risk for child marriage (categorized as a 4).

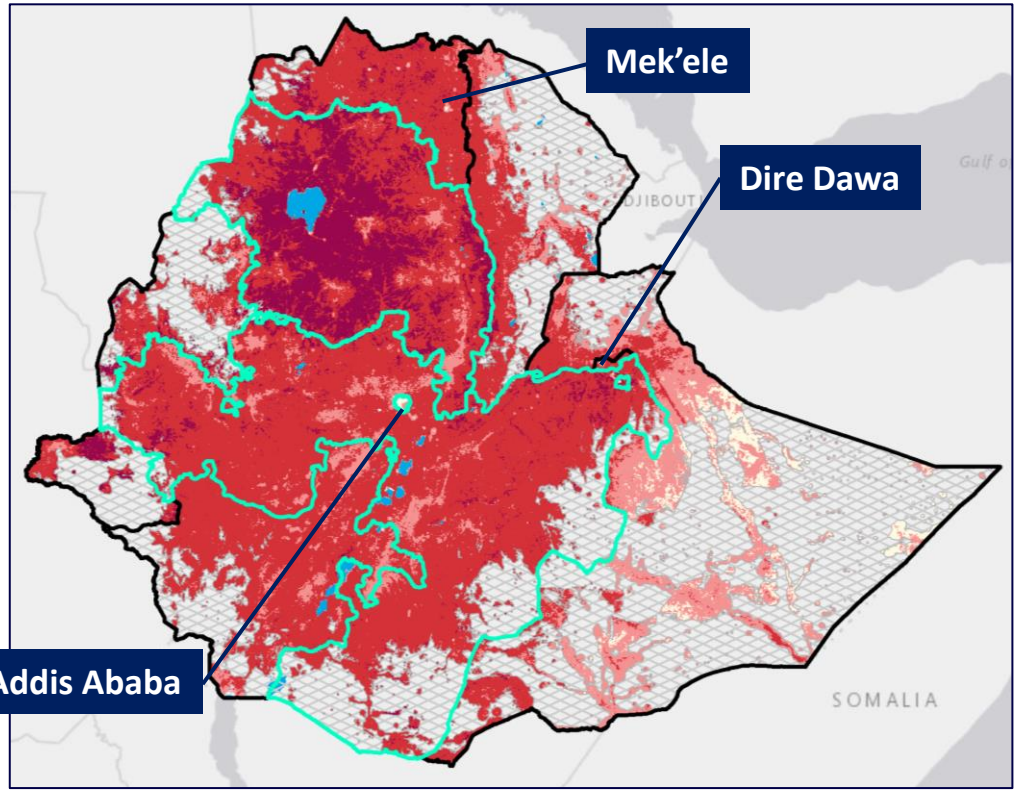
Indicator	Description	Correlation Coefficient with under-18 child marriage prevalence[1]	
		Women	Men
Domestic Violence			
Believe that there is at least one reason that justifies wife beating[2]	Proportion of women/men (aged 15-49) who agree with at least one reason that a husband is justified in hitting or beating his wife	0.36	0.24

Note 1: The correlation coefficient indicates the direction and magnitude of the relationship at the community (enumeration area) level.
Note 2: Please see the appendix for details of the specific reasons asked by the DHS.
Source: Fraym, Ethiopia DHS 2016

AT-RISK POPULATION || ATTITUDES & CHILD MARRIAGE (RISK PROFILE MAPPING)

There are an estimated 709,000 girls aged 10 to 14 who live in communities where gender inequitable attitudes, as measured by attitudes towards wife beating, represents a high risk factor for child marriage.

Attitudes towards Wife Beating Risk Category[1]



- Low Risk
- Medium-Low Risk
- Medium-High Risk
- High Risk
- Areas with total population less than 10 people per sq km
- Water bodies
- City — Large cities

Population of at-risk girls due to attitudes towards wife beating, highlighted regions

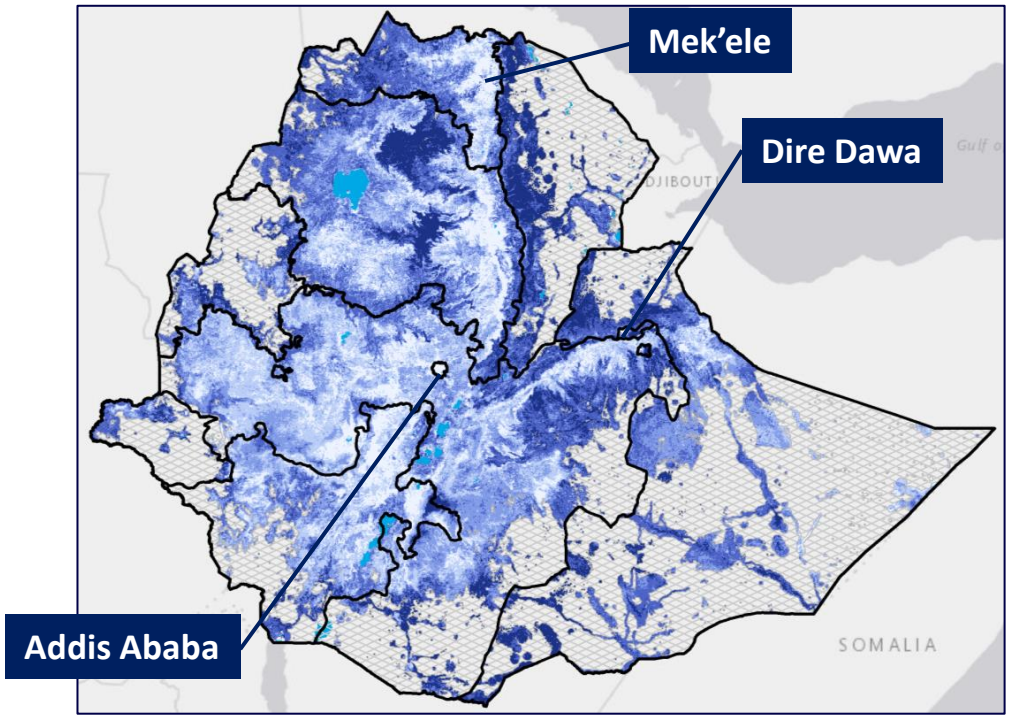
Region	Population of at-risk girls (aged 10-14)
Amhara	576,300
Oromia	85,200

Note 1: The map shows the classification of attitudes towards wife beating for each 1km^2 cell into quartiles. The attitudes towards wife beating risk categories range from a 1 to 4 scale, with 4 indicating the highest level of risk. Attitudes towards wife beating is defined as belief that there is at least one reason that justifies wife beating. Please see slide 55 or the appendix for more details.
Note 2: At-risk girls are defined as girls at risk for child marriage, that is girls aged 10-14 who live in communities with an attitudes towards wife beating risk category equal to 4 (highest risk).
Source: Fraym, Ethiopia DHS 2016, WorldPop 2020

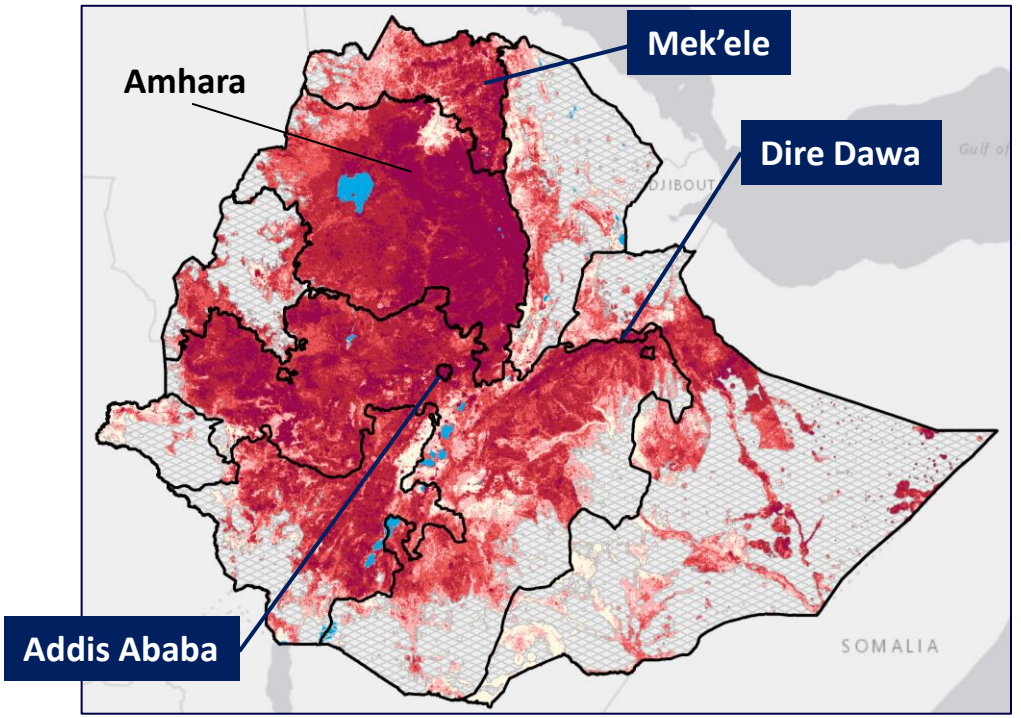
AT-RISK POPULATION || ATTITUDES & CHILD MARRIAGE (RISK PROFILE MAPPING)

In Amhara, communities with high concentrations of gender inequitable attitudes towards wife beating are more widespread than the under-18 prevalence rate.

Child Marriage Prevalence



Attitudes towards Wife Beating Risk Category[1]



Percent of women (aged 20-24) who were married before 18

0% — **65%+**

Areas with total population less than 10 people per sq km

City Large cities

- Low Risk
- Medium-Low Risk
- Medium-High Risk
- High Risk

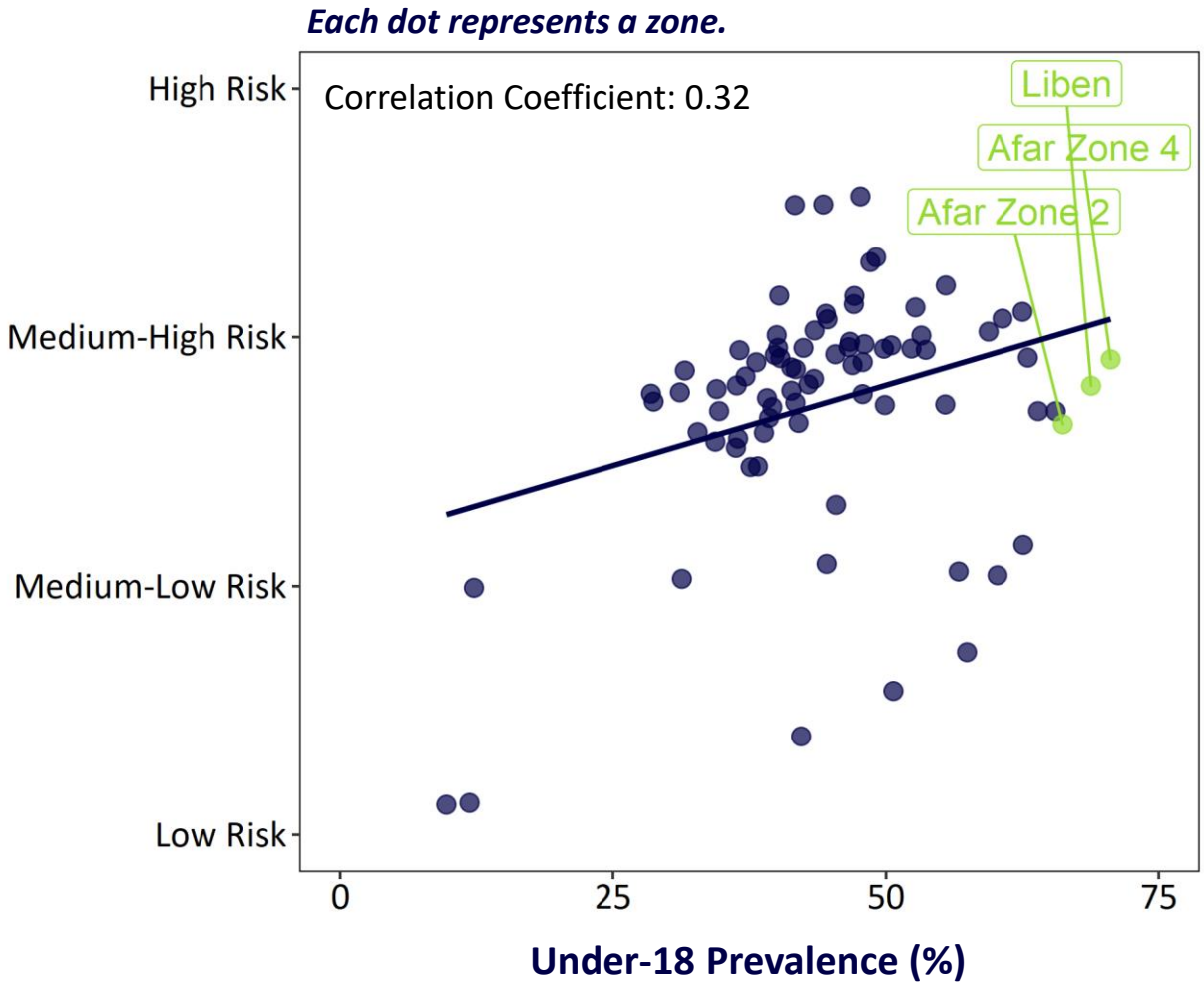
Note 1: The map shows the classification of attitudes towards wife beating for each 1km^2 cell into quartiles. The attitudes towards wife beating risk categories range on a 1 to 4 scale, with 4 indicating the highest level of risk. Attitudes towards wife beating is defined as belief that there is at least one reason that justifies wife beating. Please see slide 50 or the appendix for more details.

Source: Fraym, Ethiopia DHS 2016, WorldPop 2020

AT-RISK POPULATION || ATTITUDES & CHILD MARRIAGE (RISK PROFILE MAPPING)

At the zone level, the relationship between under-18 prevalence and the attitudes risk categories is relatively weak, suggesting that zones with higher rates of gender inequitable attitudes are only slightly more likely to have higher child marriage rates.

Average Attitudes towards Wife Beating Risk Category and Child Marriage Prevalence



Source: Fraym

AT-RISK POPULATION || BEHAVIORS & CHILD MARRIAGE (RISK PROFILE CONSTRUCTION)

Communities where women are more likely to report participating in decision-making tend to have lower child marriage prevalence.

1. Fraym examined the correlation between women's participation in decision-making and child marriage prevalence at the community level.

2. Communities with high prevalence rates tend to have low rates of women's participation in decision-making. The relationship between prevalence and decisions on large household purchases is strongest.

Indicator	Description	Correlation Coefficient with under-18 child marriage prevalence
Women's Participation in Decision Making[1]		
Woman's healthcare	Proportion of currently married women (aged 15-49) who make the decision about their healthcare alone or jointly with partner	-0.20
Large household purchases	Proportion of currently married women (aged 15-49) who make the decision about large household purchases alone or jointly with partner	-0.27
Visits to family	Proportion of currently married women (aged 15-49) who make the decision about visits to family alone or jointly with partner	-0.19
Husband's earnings	Proportion of currently married women (aged 15-49) who make the decision husband's earnings alone or jointly with partner	-0.16

Note 1: Women's participation in decision-making is defined as the woman reporting that she makes the decision on her own or jointly with her partner. Questions regarding decision making are only asked to currently married individuals. Currently married men were asked about decision making on their own healthcare and major household purchases, however these figures are excluded.
Source: Fraym, Ethiopia DHS 2016

AT-RISK POPULATION || BEHAVIORS & CHILD MARRIAGE (RISK PROFILE CONSTRUCTION)

The decision-making risk profile reflects women's participation in several household decisions.

1. Fraym used **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.

2. Fraym **combined the indicators into a decision-making risk profile index using principal component analysis (PCA)** and estimated the index scores at the community level (1 km^2).

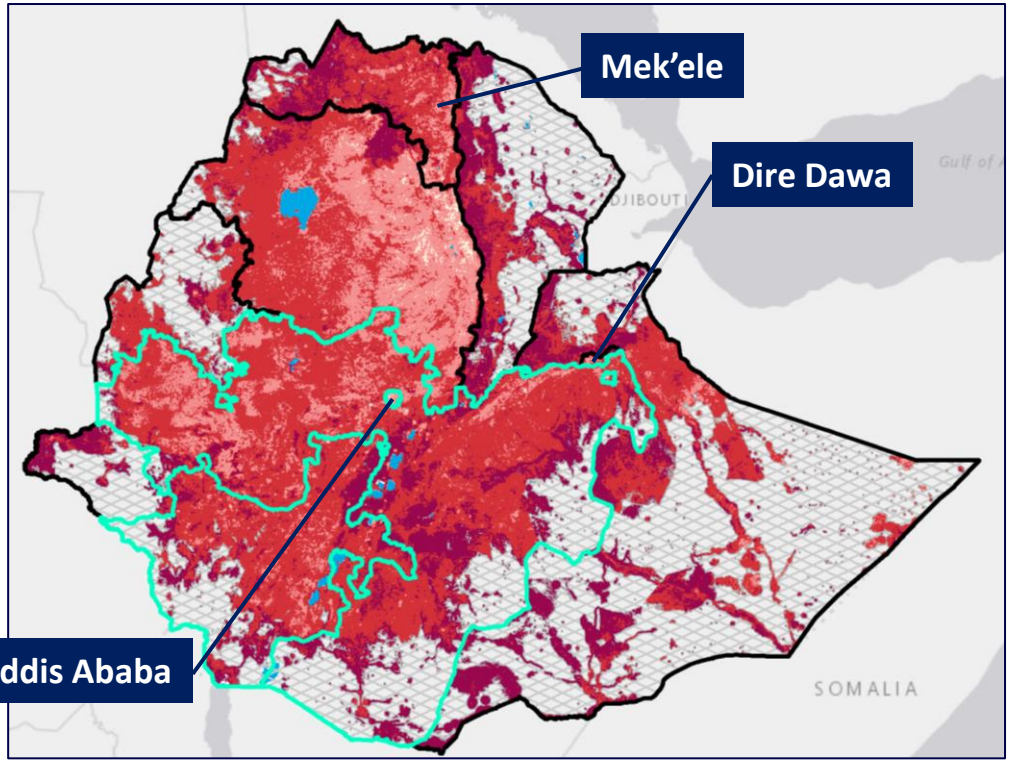
3. Fraym then **classified communities into quartiles with risk categories ranging from 1 to 4**. Communities with lower index values, or lower participation in decision-making, are categorized as a 4 ("high risk").

4. Finally, Fraym **estimated the number of at-risk girls** by calculating the total number of girls aged 10 to 14 who live in the communities where gender inequitable behavior, as measured by women's participation in decision-making, represents the highest risk for child marriage.

AT-RISK POPULATION || BEHAVIORS & CHILD MARRIAGE (RISK PROFILE MAPPING)

In communities where women's limited participation in decision-making represents a high risk for child marriage, there are an estimated 908,000 girls aged 10 to 14.

Women's Participation in Decision-Making Index Risk Category[1]



Low Risk

Medium-Low Risk

Medium-High Risk

High Risk

Areas with total population less than 10 people per sq km

Water bodies

City Large cities

Population of at-risk girls due to women's participation in decision-making, highlighted regions[2]

Region	Population of at-risk girls (aged 10-14)
Oromia	344,800
Southern Nations	213,500

Note 1: The map shows the classification of women's participation in decision-making index for each 1km^2 cell into quartiles. The risk categories range on a 1 to 4 scale, with 4 indicating the highest level of risk. Please see slides 54-55 or the appendix for more details.

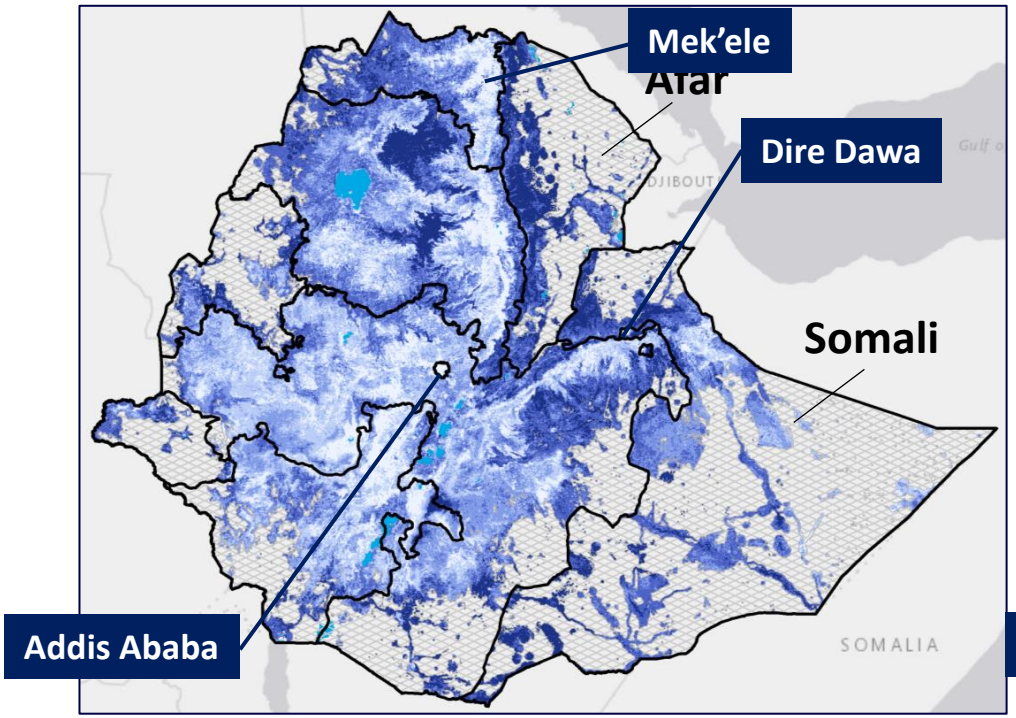
Note 2: At-risk girls are defined as girls at risk for child marriage, that is girls aged 10-14 who live in communities with a women's participation in decision-making index risk category equal to 4 (highest risk).

Source: Fraym, Ethiopia DHS 2016, WorldPop 2020

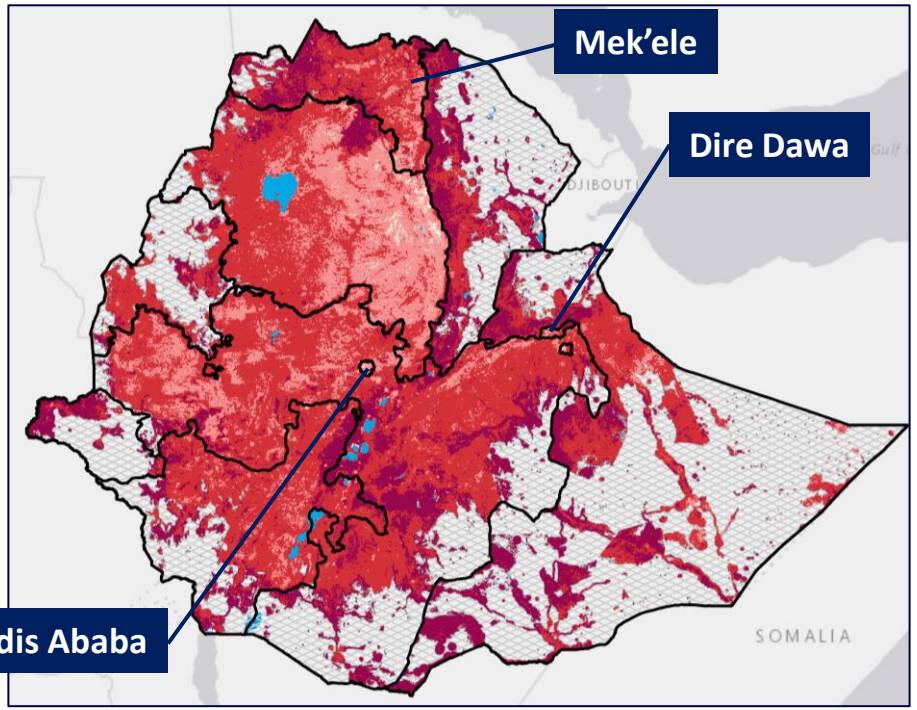
AT-RISK POPULATION || BEHAVIORS & CHILD MARRIAGE (RISK PROFILE MAPPING)

Communities classified as high risk for child marriage based on the women's participation in decision-making index are scattered throughout Ethiopia. Some of these communities, like Afar and Somali, also have high under-18 prevalence rates.

Child Marriage Prevalence



Women's Participation in Decision-Making Index Risk Category[1]



Percent of women (aged 20-24) who were married before 18

0% — **65%+**

Areas with total population less than 10 people per sq km

City Large cities

- Low Risk
- Medium-Low Risk
- Medium-High Risk
- High Risk

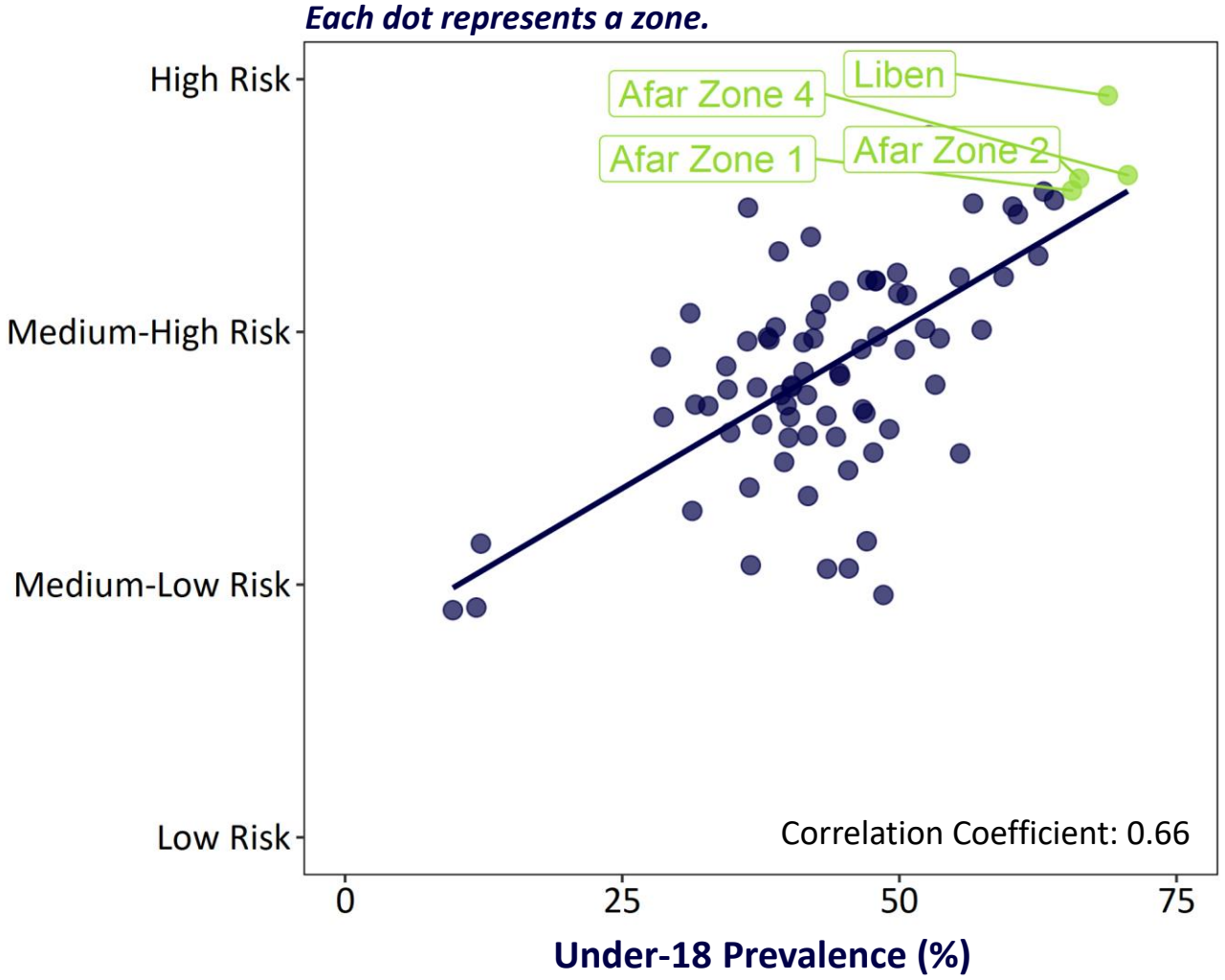
Note 1: The map shows the classification of women's participation in decision-making index for each 1km^2 cell into quartiles. The risk categories range on a 1 to 4 scale, with 4 indicating the highest level of risk. Please see slides 54-55 or the appendix for more details.

Source: Fraym, Ethiopia DHS 2016, WorldPop 2020

AT-RISK POPULATION || BEHAVIORS & CHILD MARRIAGE (RISK PROFILE MAPPING)

There is a strong, positive relationship between child marriage prevalence and risk categories for decision-making, suggesting that zones with higher rates of risk are more likely to have higher child marriage rates.

Average Women's Participation in Decision-Making Index Risk Category and Child Marriage Prevalence



Source: Fraym

AT-RISK POPULATION || TOTAL RISK ACROSS ALL PROFILES

Fraym combined each risk factor profile to assess total risk at the community level.

1. Total risk is the sum of all risk factor profiles that exhibit a relationship with child marriage prevalence, including poverty and gender equitable attitudes and behaviors. Each profile is equally weighted.

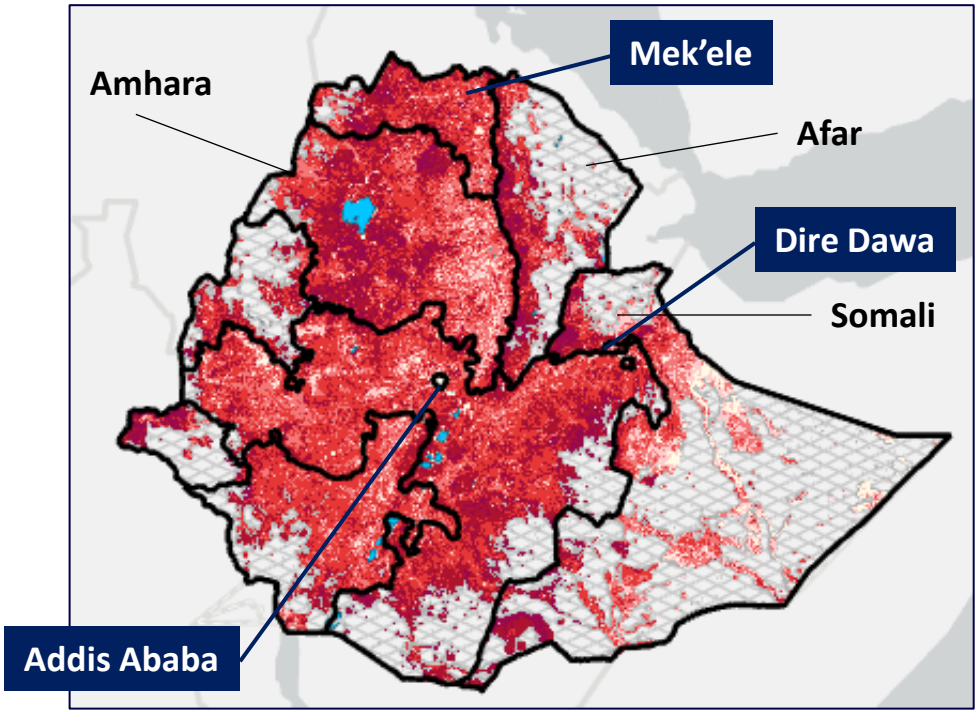
2. The total risk categories range on a 4 to 12 scale, with 12 indicating the highest level of risk. Communities with a score of 12 are classified as high risk on all profiles.

3. Very few communities are classified as high-risk on all profiles (or have a score of 12).

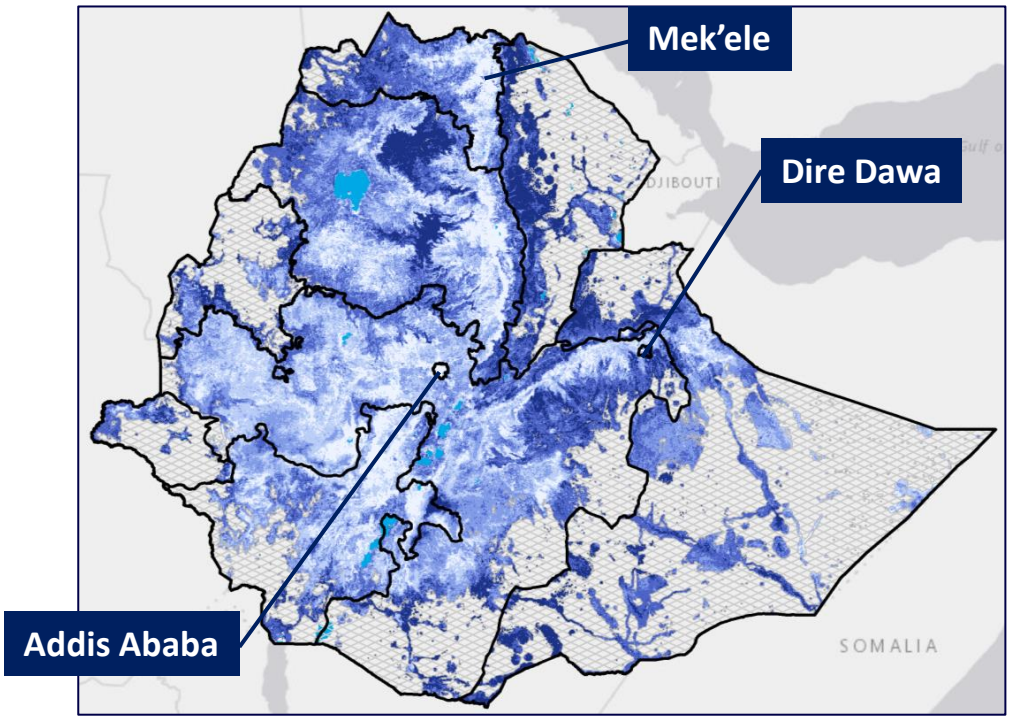
AT-RISK POPULATION || TOTAL RISK ACROSS ALL PROFILES

Communities in Afar are high risk across all profiles and have high under-18 prevalence. In Amhara total risk is more widespread, whereas under-18 prevalence is concentrated in two areas. High risk areas in Somali are also high prevalence.

Total Risk



Child Marriage Prevalence



Total Risk

Low Risk — High Risk

Areas with total population less than 10 people per sq km

City Large cities

Percent of women (aged 20-24) who were married before 18

0% — 65%+

Note 1: The total risk categories range on a 4 to 12 scale, with 16 indicating the highest level of risk. The index is the sum of poverty and gender equitable attitudes and decision-making, and equally weights each component.
Source: Fraym, Ethiopia DHS 2016, WorldPop 2020

AT-RISK POPULATION || KEY TAKEAWAYS

Fraym's analysis suggests that, in Ethiopia, poverty and gender inequitable attitudes and behaviors are most strongly associated as potential risk factors for child marriage.

1. **Pregnancy outside of marriage is largely non-existent in Ethiopia**. This suggests a very low number of related at-risk girls aged 10-14 based upon this potential risk factor.

2. **Communities with high poverty as defined by the index are scattered throughout Ethiopia**. There are an estimated 757,000 girls aged 10 to 14 who live in these high-risk communities.

3. **Communities with gender inequitable attitudes, measured as attitudes towards wife beating, are largely concentrated in Amhara, whereas communities where decision-making behavior represents a high risk for child marriage are located throughout the country**. There are an estimated 709,000 girls aged 10 to 14 in communities where gender inequitable attitudes pose a high risk and 908,000 girls in communities where limited decision-making represents a high risk.

4. **In the Afar region, most communities have high total risk and have a high under-18 prevalence rate**. In Amhara, communities with high total risk tend to be concentrated in the west, whereas prevalence is more concentrated in the east.

Hotspot Analysis

Bringing together the previous sections, Fraym identified three hotspots for child marriage: Afar, Somali, and Amhara regions.

1. Fraym defined hotspots as regions with **particularly high child marriage prevalence and/or burden**, and high concentrations of risk factors for child marriage.

2. For each hotspot, Fraym zoomed into the region of interest and **summarized key indicators and assessed the population of at-risk girls for each risk factor. Additionally, Fraym mapped the presence of infrastructure** (e.g. roads and health centers). Infrastructure affects service delivery, which may have implications for child marriage.

3. **Afar region had the highest under-18 and under-15 prevalence of child marriage in 2016 and is one of the few regions where these rates have increased since 2011**. In addition to this notable trend, an estimated 33 percent of girls aged 10-14 are at a high risk for child marriage due to poverty, the highest proportion among all regions.

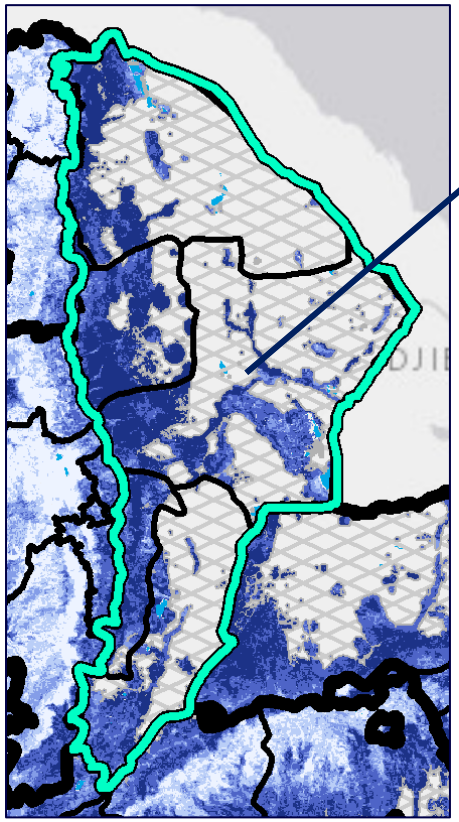
4. **Somali region had the fourth highest regional burden for both under-18 and under-15 child marriage** and tied for second highest under-18 marriage prevalence with Benshangul-Gumuz, a smaller region. Somali is also one of the few regions in which there was an increase in under-15 prevalence.

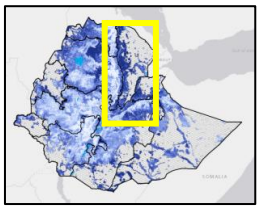
5. **Amhara region shows the second highest burden levels in the country as well as prevalence rates above the national average**. While prevalence rates decreased from 2005 to 2016, 20 percent of the region's large population of girls aged 10-14 remain at high risk for child marriage due to poverty.

HOTSPOT ANALYSIS || AFAR REGION (OVERVIEW)

Afar has the highest prevalence of both under-18 and under-15 marriage in the country.

Afar has the highest prevalence of under-18 child marriage – 66%





Percent of women (aged 20-24) who were married before 18

0% **65%+**

Key Indicators	
Under-18 Prevalence	66%
Under-18 Burden	43,300
Percent of adults (aged 15-49) who are employed	39%
Percent of women (aged 15-49) who are employed	18%
Percent of women (aged 18-49) who completed primary education or higher	5%
Percent of women (aged 15-24) who are sexually active and use a modern contraceptive method	6%
Percent of individuals in a household with access to electricity	13%
Percent of individuals in a household with a flush toilet	3%

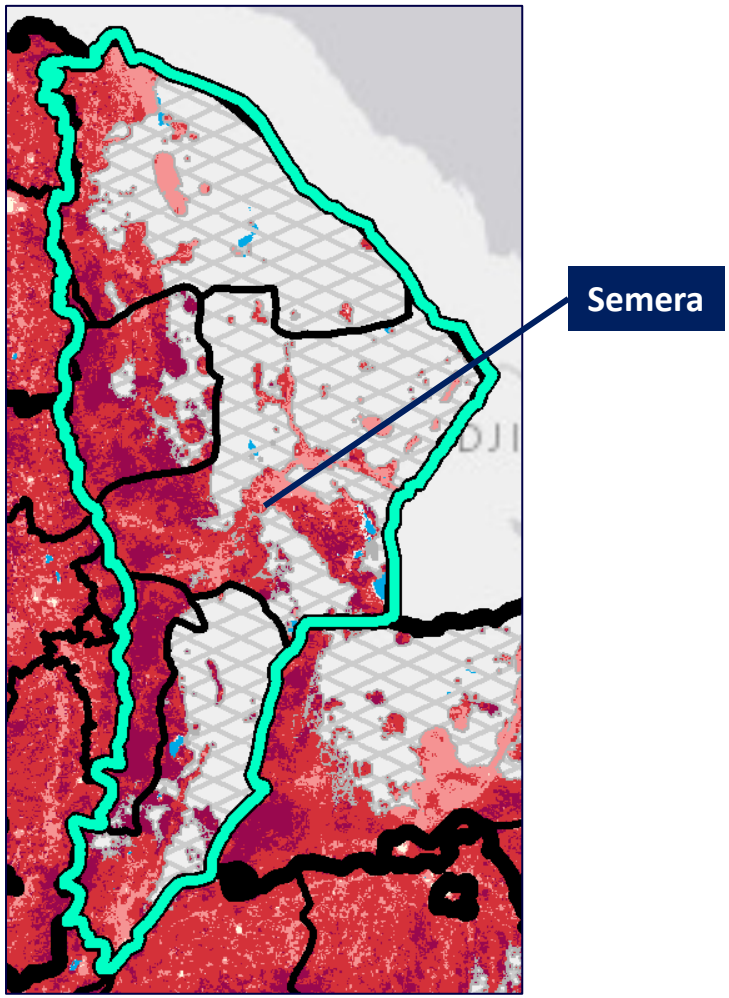
City Region capital

fraym **Source:** Fraym, Ethiopia DHS 2016

HOTSPOT ANALYSIS || AFAR REGION (RISK PROFILE MAPPING)

In Afar, many communities are categorized as very poor or within the high-risk category, which indicates poverty is a likely risk factor for child marriage.

Poverty Index Risk Category[1]



Low Risk

Medium-Low Risk

Medium-High Risk

High Risk

Areas with total population less than 10 people per sq km

City Region capital

Population of at-risk girls (aged 10-14) due to poverty as a factor[2]	40,000

Note 1: The map shows the classification of the poverty index for each 1km^2 cell into quartiles. The poverty index risk categories range on a 1 to 4 scale, with 4 indicating the highest level of risk. See slide 45 or the appendix for more details.

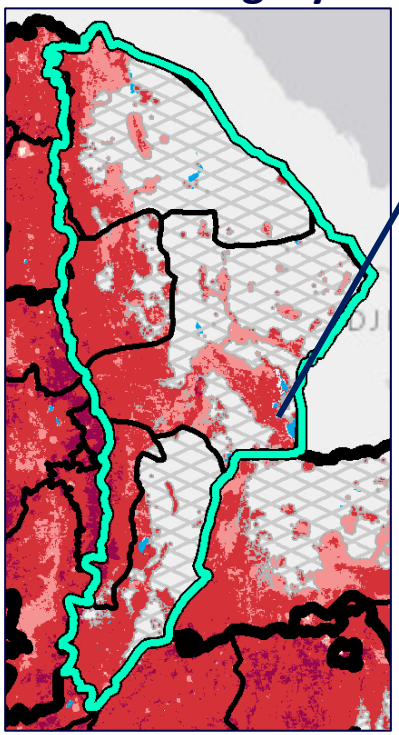
Note 2: At-risk girls are defined as girls at risk for child marriage, that is girls aged 10-14 who live in communities with a poverty index risk category equal to 4 (highest risk).

Source: Fraym, Ethiopia DHS 2016, WorldPop 2020

HOTSPOT ANALYSIS || AFAR REGION (RISK PROFILE MAPPING)

Communities where limited participation in decision-making is a high-risk factor for child marriage are more widespread than that of gender inequitable attitudes.

Attitudes Towards Wife Beating Risk Category[1]



Low Risk

Medium-Low Risk

Medium-High Risk

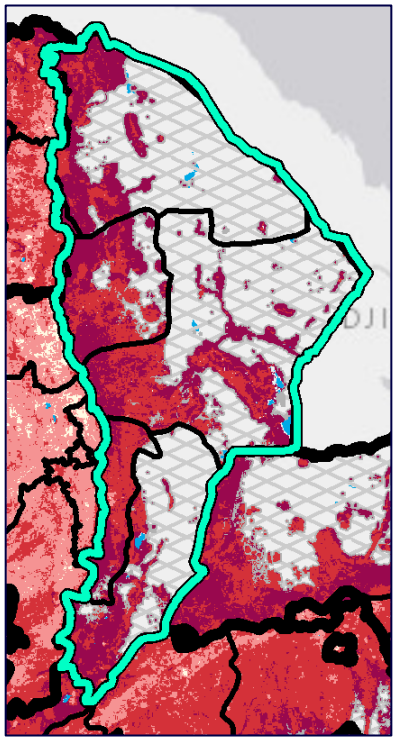
High Risk

Areas with total population less than 10 people per sq km

City Region capital

Population of at-risk girls (aged 10-14) due to attitudes as a factor[3]	4,100

Women's Participation in Decision-Making Index Risk Category[2]



Population of at-risk girls (aged 10-14) due to decision-making as a factor[3]	71,100

Note 1: The map shows the classification of attitudes towards wife beating for each 1km^2 cell into quartiles. The attitudes towards wife beating risk categories range on a 1 to 4 scale, with 4 indicating the highest level of risk. Attitudes towards wife beating is defined as belief that there is at least one reason that justifies wife beating. Please see slide 50 or the appendix for more details.

Note 2: The map shows the classification of women's participation in decision-making index for each 1km^2 cell into quartiles. The risk categories range on a 1 to 4 scale, with 4 indicating the highest level of risk. Please see slides 54-55 or the appendix for more details.

Note 3: At-risk girls are defined as girls at risk for child marriage, that is girls aged 10-14 who live in communities with a attitudes towards wife beating risk category or decision-making index risk category equal to 4 (highest risk).

Source: Fraym, Ethiopia DHS 2016, WorldPop 2020

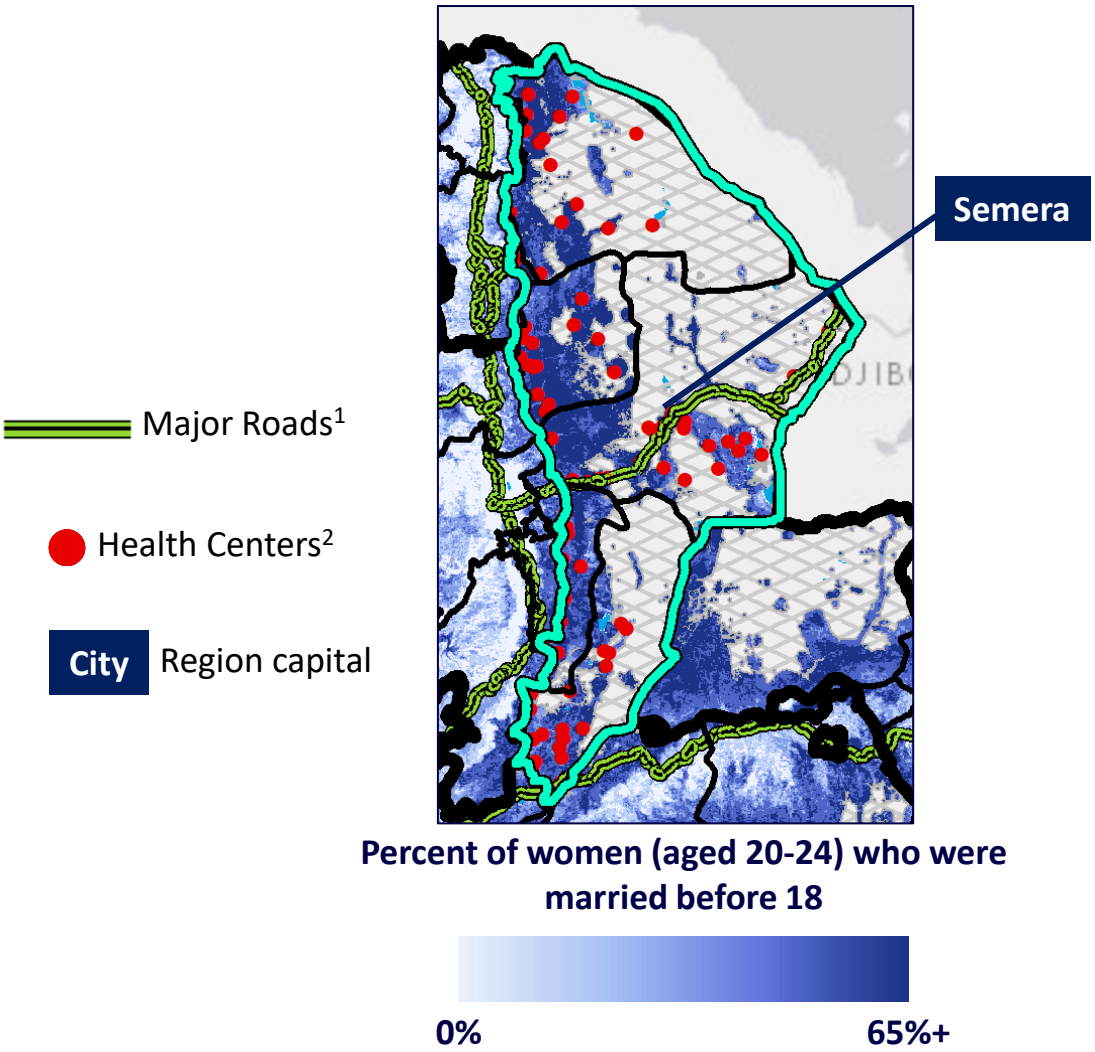
HOTSPOT ANALYSIS || AFAR REGION (INFRASTRUCTURE AND SERVICES)

Infrastructure affects service delivery, which may have implications for child marriage. Most communities in Afar have limited major transportation infrastructure. Health center coverage is above the national average.

1 There is a single major transborder road that runs east to west through Afar. Many high prevalence communities may have limited connectivity.

2 There are roughly six public health centers per 100,000 people, which is slightly above the national rate (four per 100,000 people). Health centers are evenly distributed throughout the region, apart from a small area in the west.

Infrastructure in Afar



Note 1: Major roads include motorways, trunk roads, and primary roads, which are the most important roads in a country's road network.
Note 2: Public health centers come from the World Health Organization.
Source: Fraym, Ethiopia DHS 2016, WHO, OpenStreetMaps

HOTSPOT ANALYSIS || AFAR REGION (ZONE-LEVEL DATA)

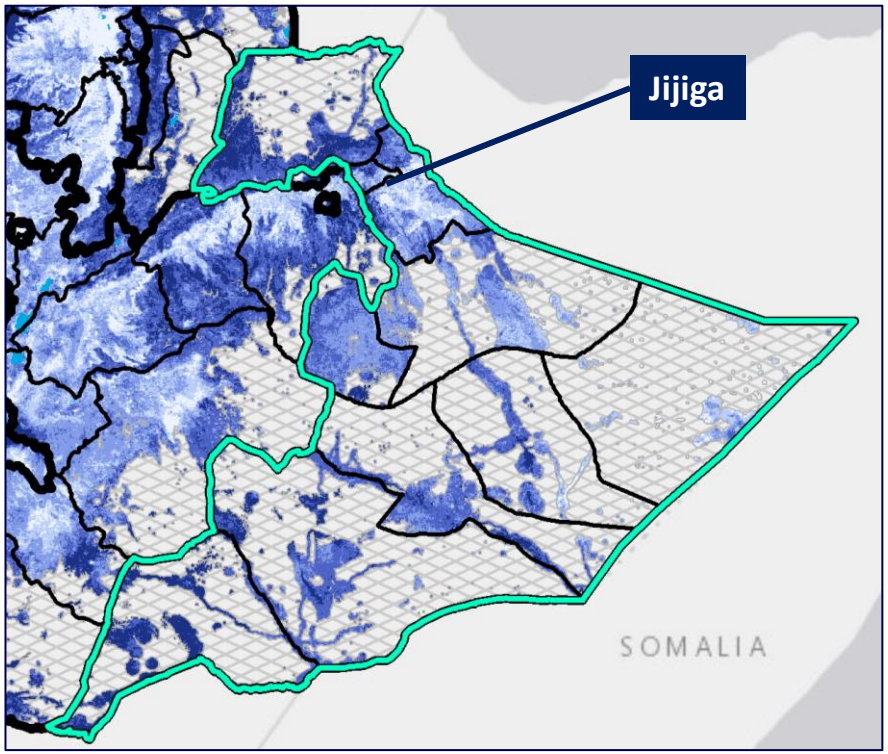
Within the Afar region, Fanti Rasu has the highest under-18 prevalence rate and the lowest female employment rate in the country.

Indicator	Awsi Rasu	Kilbati Rasu	Gabi Rasu	Fanti Rasu	Harri Rasu
Child Marriage					
Under-18 Prevalence	66%	66%	63%	71%	63%
Population of At-Risk Girls (aged 10-14), by Profile[1]					
Poverty	7,240	3,791	6,900	11,700	9,150
Gender Inequitable Attitudes	400	200	400	300	2800
Limited Decision-Making	20,200	19,500	9,600	14,900	5,900
Community Characteristics					
Total Population	466,000	403,000	239,000	332,000	249,000
Number of Health Centers Per 100,000 People	7	4	10	4	4
Percent of women (aged 15-49) who are employed	17%	18%	22%	14%	18%
Percent of women (aged 18-49) who completed primary education or higher	8%	11%	8%	4%	4%

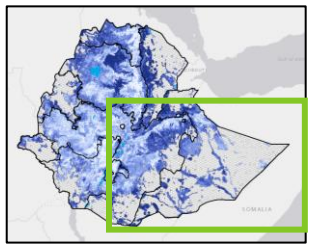
Note 1: The total number of at-risk girls for pregnancy outside of marriage is excluded because the estimate at the region level is less than 20.
Source: Fraym

HOTSPOT ANALYSIS || SOMALI REGION (OVERVIEW)

Somali has the second highest under-18 prevalence rate. High prevalence areas are most concentrated in the north and the southwest.



Key Indicators	
Under-18 Prevalence	55%
Under-18 Burden	123,000
Percent of adults (aged 15-49) who are employed	45%
Percent of women (aged 15-49) who are employed	22%
Percent of women (aged 18-49) who completed primary education or higher	5%
Percent of women (aged 15-24) who are sexually active and use a modern contraceptive method	4%
Percent of individuals in a household with access to electricity	13%
Percent of individual in a household with a flush toilet	3%



Percent of women (ages 20-24) who were married before 18

0% **65%+**

Areas with total population less than 10 people per sq km

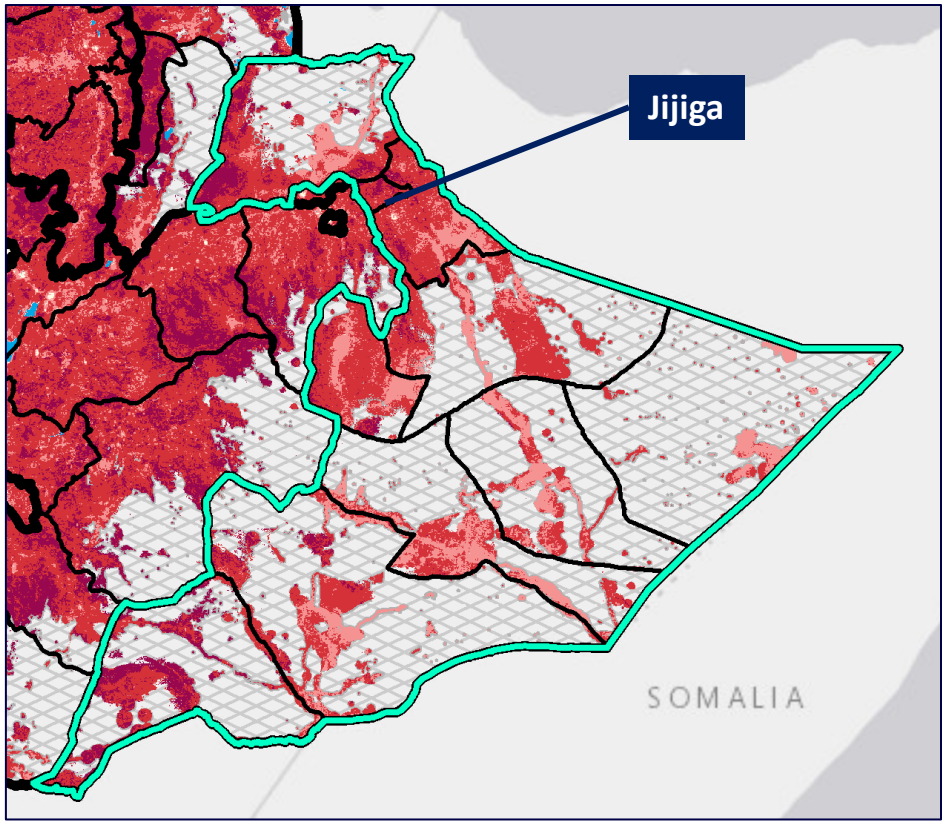
City Region capital

Source: Fraym, Ethiopia DHS 2016

HOTSPOT ANALYSIS || SOMALI REGION (RISK PROFILE MAPPING)

Somali has the third highest population of at-risk girls due to poverty as a potential risk factor for child marriage among regions.

Poverty Index Risk Category[1]



- Low Risk
- Medium-Low Risk
- Medium-High Risk
- High Risk
- Areas with total population less than 10 people per sq km
- City — Region capital

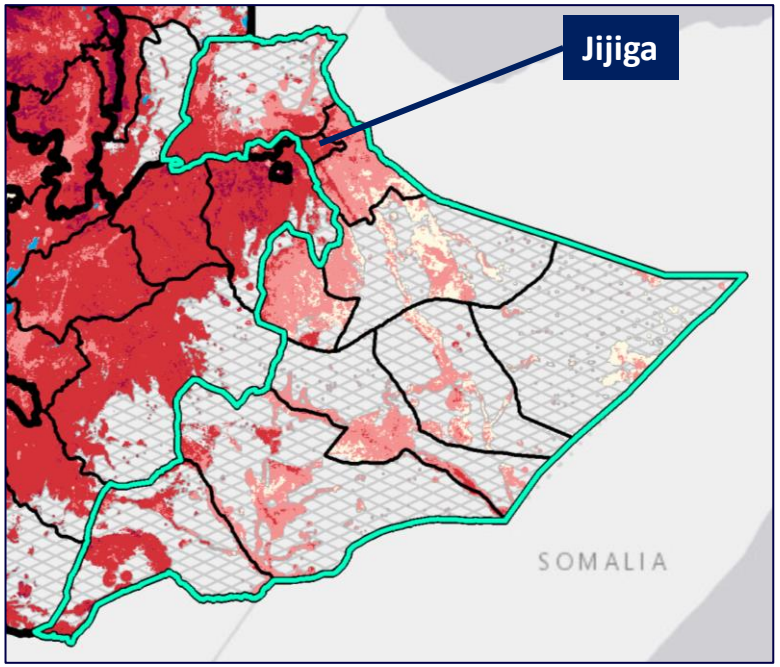
Population of at-risk girls (aged 10-14) due to poverty as a factor[2]	52,470

Note 1: The map shows the classification of the poverty index for each 1km^2 cell into quartiles. The poverty index risk categories range on a 1 to 4 scale, with 4 indicating the highest level of risk. See slide 45 or the appendix for more details.
Note 2: At-risk girls are defined as girls at risk for child marriage, that is girls aged 10-14 who live in communities with a poverty index risk category equal to 4 (highest risk).
Source: Fraym, Ethiopia DHS 2016, WorldPop 2020

HOTSPOT ANALYSIS || SOMALI REGION (RISK PROFILE MAPPING)

There are very few communities where gender inequitable attitudes represents a high-risk factor for child marriage, whereas limited decision-making, as a risk factor, is more prominent.

Attitudes Towards Wife Beating Risk Category[1]



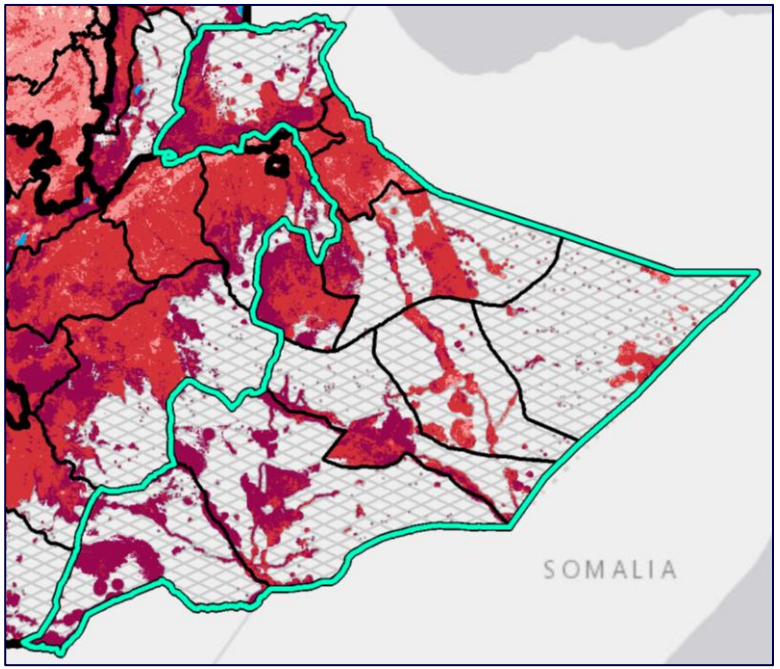
Population of at-risk girls (aged 10-14) due to attitudes as a factor[3]	2,300

Low Risk
Medium-Low Risk
Medium-High Risk
High Risk

Areas with total population less than 10 people per sq km

City Region capital

Women's Participation in Decision-Making Index Risk Category[2]



Population of at-risk girls (aged 10-14) due to decision-making as a factor[3]	191,100

Note 1: The map shows the classification of attitudes towards wife beating for each 1km^2 cell into quartiles. The attitudes towards wife beating risk categories range on a 1 to 4 scale, with 4 indicating the highest level of risk. Attitudes towards wife beating is defined as belief that there is at least one reason that justifies wife beating. Please see slide 50 or the appendix for more details.

Note 2: The map shows the classification of women's participation in decision-making index for each 1km^2 cell into quartiles. The risk categories range on a 1 to 4 scale, with 4 indicating the highest level of risk. Please see slides 54-55 or the appendix for more details.

Note 3: At-risk girls are defined as girls at risk for child marriage, that is girls aged 10-14 who live in communities with a attitudes towards wife beating risk category or decision-making index risk category equal to 4 (highest risk).

Source: Fraym, Ethiopia DHS 2016, WorldPop 2020

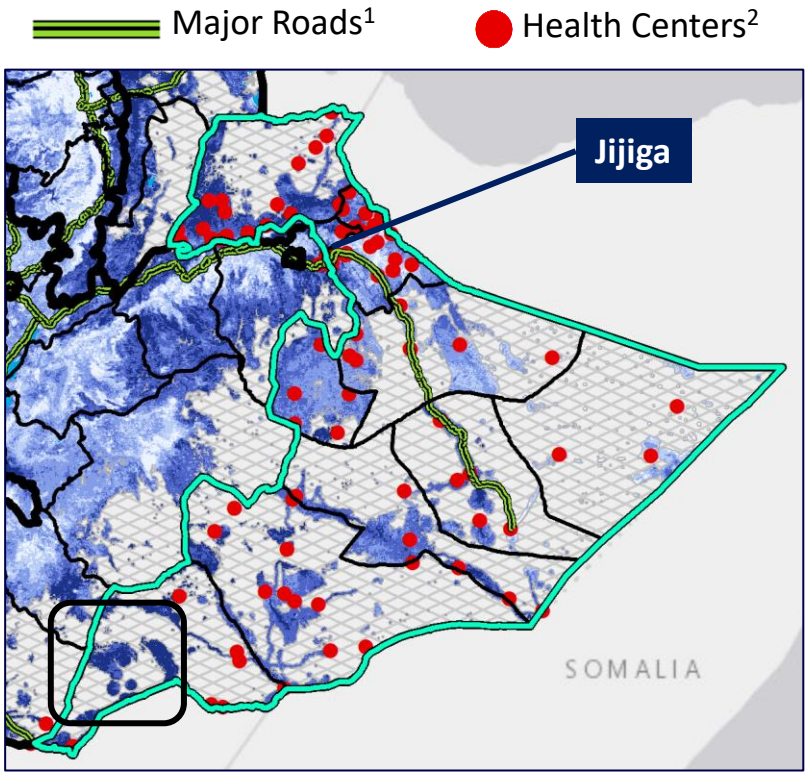
HOTSPOT ANALYSIS || SOMALI REGION (INFRASTRUCTURE AND SERVICES)

Population and infrastructure are largely concentrated in the north of Somali. High prevalence areas in the southwest, while sparsely populated, are disconnected.

1 There is limited major road infrastructure throughout Somali, which runs through the regional capital in the north, Jijiga. Many communities, especially high prevalence areas in the southwest, have limited transportation access.

2 There are roughly 2 public health centers per 100,000 people, which is lower than the national rate (5 per 100,000 people). Lack of access to health services may have negative implications for women married as children.

Infrastructure in Somali



Note 1: Major roads include motorways, trunk roads, and primary roads, which are the most important roads in a country's road network.
Note 2: Public health centers come from the World Health Organization.
Source: Fraym, Ethiopia DHS 2016, WHO, OpenStreetMaps

HOTSPOT ANALYSIS || SOMALI REGION (ZONE-LEVEL DATA)

Liben has the highest under-18 prevalence rate, and large numbers of at-risk girls due to poverty and limited decision-making.

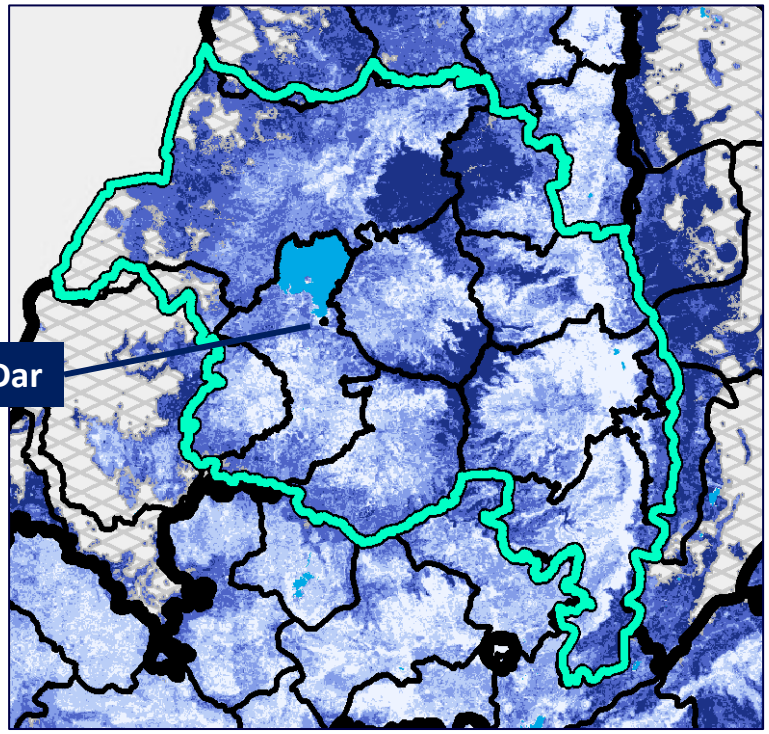
Indicator	Afder	Doolo	Fanfan	Jarar	Korahe	Liben	Nogob	Shabelle	Siti
Child Marriage									
Under-18 Prevalence	63%	42%	45%	51%	57%	69%	57%	60%	64%
Population of At-Risk Girls (aged 10-14), by Profile[1]									
Poverty	6,000	30	4,500	560	520	24,300	2,900	160	13,500
Gender Inequitable Attitudes	<10	-	80	-	-	700	-	-	1,500
Limited Decision-Making	44,200	2,600	1,800	8,900	5,400	52,200	17,500	23,000	35,500
Community Characteristics									
Total Population	655,000	239,000	1,360,000	593,000	346,000	594,000	493,000	561,000	749,000
Number of Health Centers Per 100,000 People	2	2	2	2	2	1	1	1	3
Percent of women (aged 15-49) who are employed	23%	23%	24%	21%	21%	24%	18%	24%	18%
Percent of women (aged 18-49) who completed primary education or higher	7%	11%	10%	6%	9%	6%	4%	11%	7%

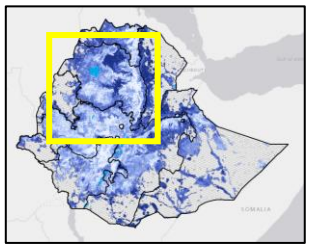
Note 1: The total number of at-risk girls for pregnancy outside of marriage is excluded because the estimate at the region level is less than 10.
Source: Fraym

HOTSPOT ANALYSIS || AMHARA REGION (OVERVIEW)

While Amhara has the sixth highest overall prevalence of child marriage, pockets of high prevalence exist especially in the central and northern zones.

The under-18 prevalence rate in Amhara is 44%





Percent of women (aged 20-24) who were married before 18

0% **65%+**

City Region capital

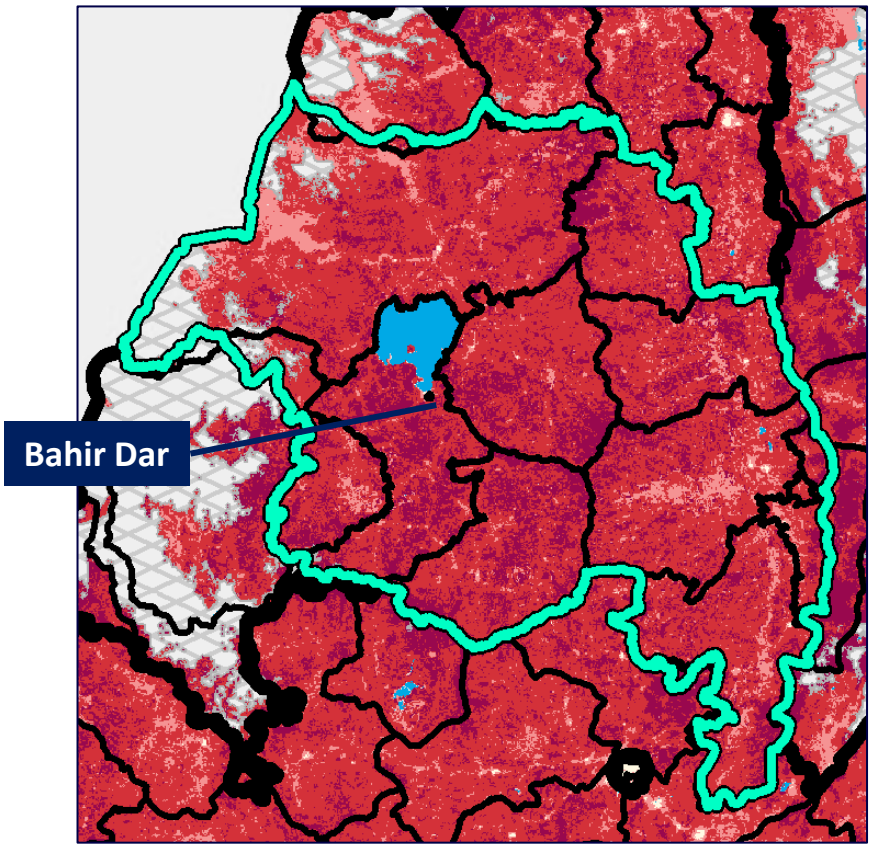
Key Indicators	
Under-18 Prevalence	44%
Under-18 Burden	402,000
Percent of adults (aged 15-49) who are employed	21%
Percent of women (aged 15-49) who are employed	8%
Percent of women (aged 18-49) who completed primary education or higher	4%
Percent of women (aged 15-24) who are sexually active and use a modern contraceptive method	1%
Percent of individuals in a household with access to electricity	19%
Percent of individuals in a household with a flush toilet	3%

fraym **Source:** Fraym, Ethiopia DHS 2016

HOTSPOT ANALYSIS || AMHARA REGION (RISK PROFILE MAPPING)

Communities where poverty represents a high risk for child marriage are clustered in the south.

Poverty Index Risk Category[1]



- Low Risk
- Medium-Low Risk
- Medium-High Risk
- High Risk
- Areas with total population less than 10 people per sq km
- City Region capital

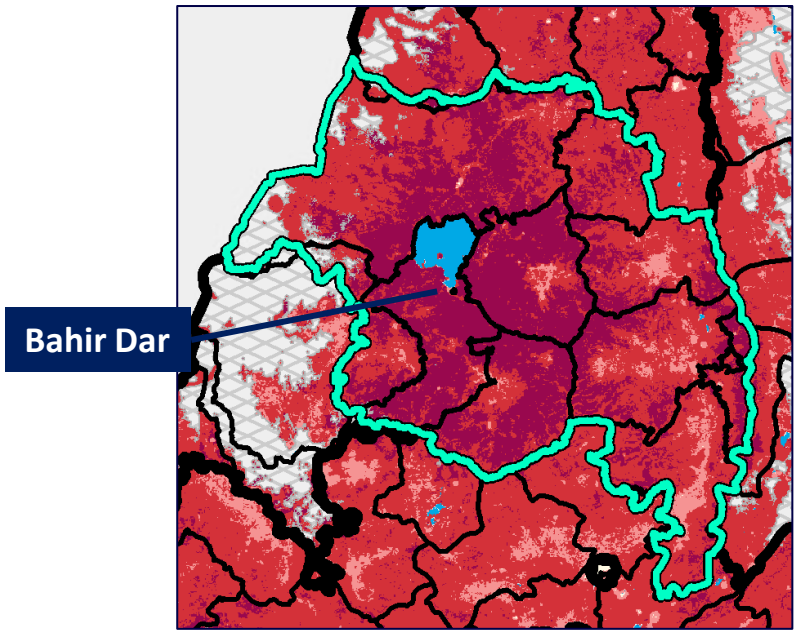
Population of at-risk girls (aged 10-14) due to poverty as a factor[2]	276,800

Note 1: The map shows the classification of the poverty index for each 1km^2 cell into quartiles. The poverty index risk categories range on a 1 to 4 scale, with 4 indicating the highest level of risk. See slide 45 or the appendix for more details.
Note 2: At-risk girls are defined as girls at risk for child marriage, that is girls aged 10-14 who live in communities with a poverty index risk category equal to 4 (highest risk).
Source: Fraym, Ethiopia DHS 2016, WorldPop 2020

HOTSPOT ANALYSIS || AMHARA REGION (RISK PROFILE MAPPING)

Several zones in Amhara are at high risk for child marriage due to gender inequitable attitudes, whereas decision-making as a risk factor is concentrated in two zones: Semen Gondar and Wag Himra.

Attitudes Towards Wife Beating Risk Category[1]



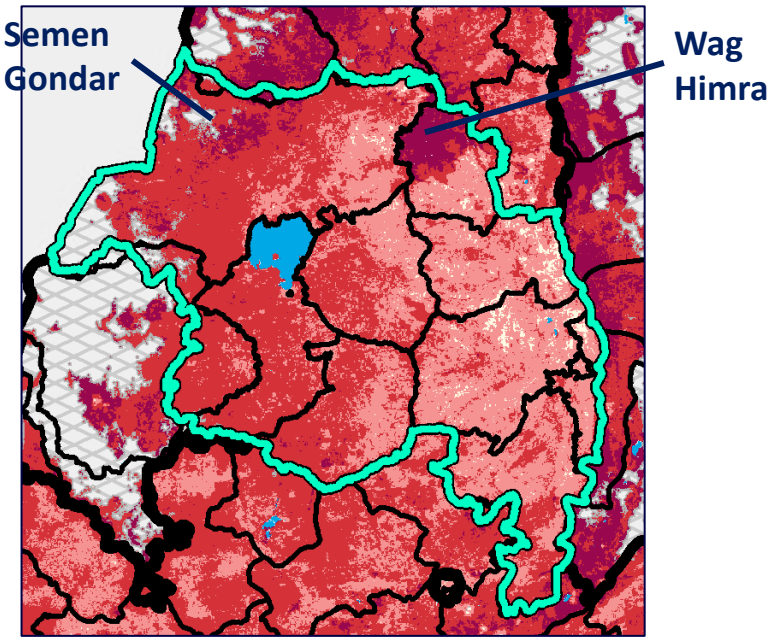
Low Risk
Medium-Low Risk
Medium-High Risk
High Risk

Areas with total population less than 10 people per sq km

City Region capital

Population of at-risk girls (aged 10-14) due to attitudes as a factor	574,900

Women's Participation in Decision-Making Index Risk Category[2]



Population of at-risk girls (aged 10-14) due to decision-making as a factor	18,000

Note 1: The map shows the classification of attitudes towards wife beating for each 1km^2 cell into quartiles. The attitudes towards wife beating risk categories range on a 1 to 4 scale, with 4 indicating the highest level of risk. Attitudes towards wife beating is defined as belief that there is at least one reason that justifies wife beating. Please see slide 50 or the appendix for more details.

Note 2: The map shows the classification of women's participation in decision-making index for each 1km^2 cell into quartiles. The risk categories range on a 1 to 4 scale, with 4 indicating the highest level of risk. Please see slides 54-55 or the appendix for more details.

Note 3: At-risk girls are defined as girls at risk for child marriage, that is girls aged 10-14 who live in communities with a attitudes towards wife beating risk category or decision-making index risk category equal to 4 (highest risk).

Source: Fraym, Ethiopia DHS 2016, WorldPop 2020

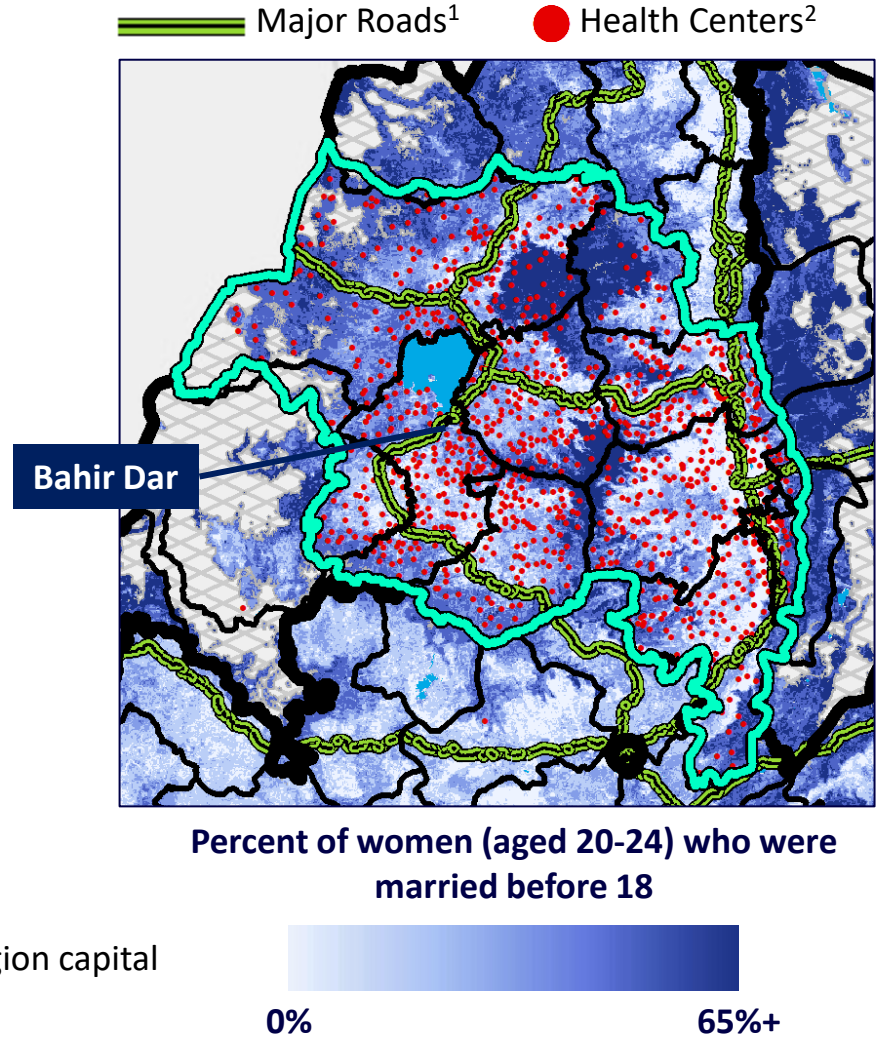
HOTSPOT ANALYSIS || AMHARA COUNTY (INFRASTRUCTURE AND SERVICES)

Amhara has good transportation and health infrastructure compared to other regions. However, high prevalence areas are disconnected from major roadways.

1. Given its population size, there are several major roads that intersect Amhara. However, the pockets of high prevalence east and south of Lake Tana appear to be less connected.

2. There are roughly 5 public health centers per 100,000 people, which is the same as the national rate (5 per 100,000 people).[2]

Infrastructure in Amhara Region



Note 1: Major roads include motorways, trunk roads, and primary roads, which are the most important roads in a country's road network.
Note 2: Public health centers come from the World Health Organization
Source: Fraym, Ethiopia DHS 2016, WHO, OpenStreetMaps

HOTSPOT ANALYSIS || AMHARA REGION (ZONE-LEVEL DATA)

Indicator	Agew Awi	Argoba	Bahir Dar (Special Zone)	Debub Gondar	Debub Wollo	Mirab Gojjam	Misraq Gojjam	North Shewa	Oromia	Semen Gondar	Semen Wello	Wag Himra
Child Marriage												
Under-18 Prevalence	40%	49%	12%	48%	37%	42%	44%	42%	47%	49%	44%	56%
Population of At-Risk Girls, by Profile [1]												
Poverty	15,400	140	-	43,500	26,000	50,400	52,600	23,500	4,600	32,300	22,900	5,600
Gender Inequitable Attitudes	23,800	800	-	112,200	42,200	108,200	115,000	18,500	11,000	110,800	24,400	7,900
Limited Decision-Making	260	-	-	<10	100	450	2,600	800	70	8,100	120	5,500
Community Characteristics												
Total Population	1,290,000	45,000	201,000	2,700,000	3,330,000	2,650,000	2,970,000	2,430,000	605,000	3,830,000	1,980,000	573,000
Number of Health Centers Per 100,000 People	4	4	NA	5	5	6	4	3	9	6	8	2
Percent of women (aged 15-49) who are employed	38%	24%	54%	29%	30%	33%	31%	28%	27%	31%	26%	21%
Percent of women (aged 18-49) who completed primary education or higher	18%	6%	64%	13%	20%	18%	15%	15%	13%	18%	14%	11%

Note 1: The total number of at-risk girls for pregnancy outside of marriage is exclude as it was determined to be an unlikely risk factor for child marriage in Ethiopia.
Source: Fraym

Appendix

I. Definitions

II. Data and Methodology

APPENDIX | | DEFINITIONS

Indicator	Description
Child Marriage	
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.

Note: All indicators are from the 2016 Ethiopia DHS. Child marriage prevalence is also calculated using the 2011 Ethiopia DHS and 2005 Ethiopia DHS.

APPENDIX | | DEFINITIONS

Indicator	Description
Community Context	
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 (ages 18-49) who completed primary school or higher.
Male Educational Attainment	Percent of men (aged 18-49) who completed primary school or higher.
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 Access	Percent of individuals that live in a household with a flush toilet.

Note: All indicators are from the 2016 Ethiopia DHS. Child marriage prevalence is also calculated using the 2011 Ethiopia DHS and 2005 Ethiopia DHS.

APPENDIX | | DEFINITIONS

Indicator	Description
Risk Profiles	
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 Wife Beating	Attitudes towards wife beating 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.

Note: All indicators are from the 2016 Ethiopia DHS. Child marriage prevalence is also calculated using the 2011 Ethiopia DHS and 2005 Ethiopia DHS.

APPENDIX || DATA AND METHODOLOGY

Fraym Data Sources

The Fraym platform weaves together the latest satellite imagery and geostatistical datasets with professionally enumerated household surveys. This allows for the disaggregation and re-aggregation of large datasets to cover any geographically bounded area.

For this report, indicators at the individual and household levels were sourced from the 2016 Ethiopia Demographic and Health Survey (DHS), 2011 DHS, and 2005 DHS.

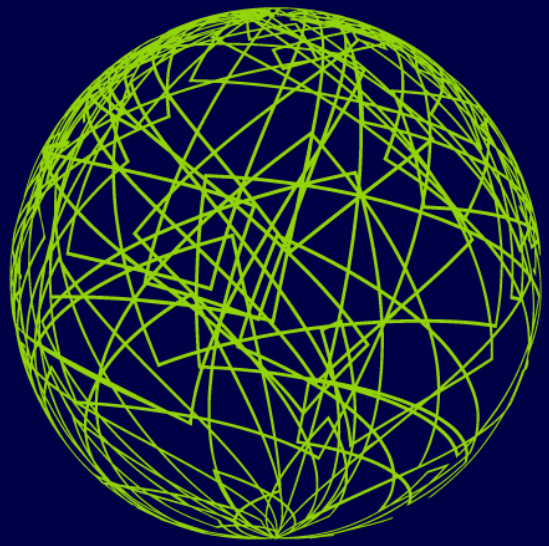
Additionally, granular population distribution data comes from WorldPop, a publicly available and detailed population distribution and composition data source that leverages existing census data to produce 100m x 100m resolution estimates of population density. In order to build its datasets, WorldPop relies on census data as the main primary data input, and large geotagged household surveys when they are not available. In order to project into the future from the latest census of a given country, WorldPop uses subnational and urban rural growth rates that are reconciled with UN estimates. For this report, population estimates from 2020 were used for the community context indicators and risk profiles. For prevalence and burden, population data corresponding to the year of the survey was used (2016, 2011, and 2005).

Fraym Methodology

Fraym data scientists closely examine representativeness, sampling frames, questionnaire coverage, periodicity, and a range of other factors. **Fraym obtains microdata**, e.g. individual rows of responses of survey data, in order to avoid any manipulation that could potentially occur during the analysis phase.

In Ethiopia, the surveys were implemented by the Central Statistical Agency of Ethiopia with financial, technical, and managerial support by large **internationally respected organizations**, including the World Bank, US Agency for International Development, the Gates Foundation, ORC Macro, and Minnesota Population Center. These surveys are designed to be representative of both the *de jure* and *de facto* populations.

These surveys typically use a **stratified, two-stage cluster design** that ensures representative samples for the national and subnational levels. After data collection, *post-hoc* sampling weights are created to account for any oversampling and ensure representativeness particularly at hyperlocal levels.



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