Teenage, Married, and Out of School

Effects of early marriage and childbirth on school dropout

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INTRODUCTION

Over the past decade, as Sub-Saharan Africa saw the expansion of universal primary enrollment policies, gender balance in primary school participation improved considerably, with girls now attending school almost at the same rate as boys[1].

Gains in primary school, however, have not carried over to secondary: For every 100 boys, only 82 girls of secondary school age are enrolled across the region, up from 80 in the year 2000. The potential reasons for a gender gap at the secondary level are numerous: Many of the barriers to secondary school participation, such as school fees, greater travel distances to secondary schools, and absence of water and sanitation facilities, or the financial pressures on families, who must choose which of their children attends school, often negatively affect girls to a greater extent than boys.

In addition to these structural challenges, a growing advocacy literature suggests that social and cultural pressures for young women to marry and begin a family at school-going ages can also curtail female school attendance rates. International agencies have mounted criticism of local customs and practices that encourage gender stereotyping and contribute to early marriage and pregnancy, and call for international pressure to end child marriage practices (ICRW, 2013; Samati, 2013; UNFPA, 2012). The argument linking early marriage and education is intuitive: Girls who marry early are said to have few opportunities to attend school, and consequently, high marriage rates affect overall school enrollment rates for teen girls (Figure 1). At the same time, however, critics of the advocacy literature contend that an absence of schooling opportunities or a lack of employment options may also lead to early marriage decisions. In other words, girls may drop out for other reasons and then, unable to continue their education, enter an early marriage (Lloyd & Mensch, 2006).

In this paper, we tackle the question of causality between early marriage and school dropout, using data from the Demographic and Health Surveys (DHS) from nine Southern and Eastern African countries. By comparing school participation patterns of girls who were married before or during the school year in question to those were never married, we are able to establish a sequence of events and therefore, a more solid foundation for treating marriage as a cause of school dropout. In short, the first research question for this paper is as follows:

Research Question 1. How does a teenage girl's marital status affect her participation in school?

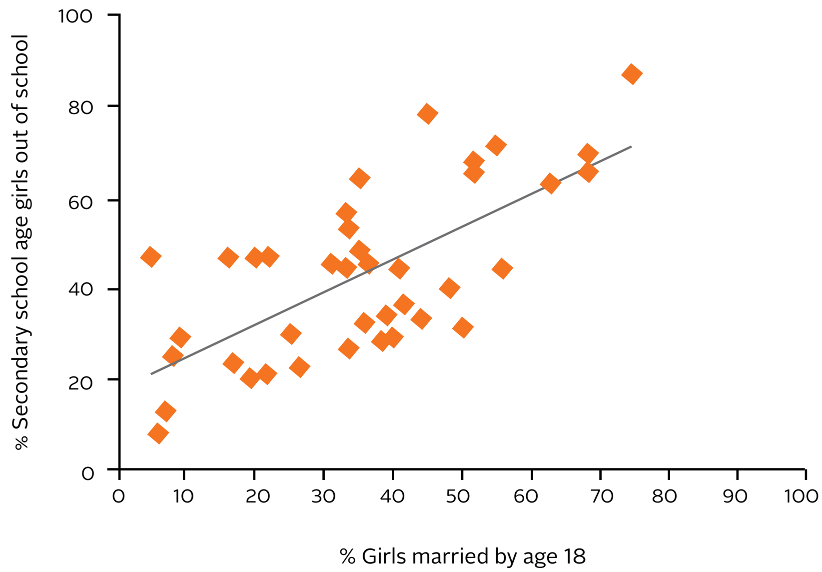
Much of the literature (both research and advocacy) on early marriage points to greater prevalence of this phenomenon in poorer and rural areas across the continent, where traditional beliefs and practices are stronger, and the perceived financial benefits of marriage are greater. However, what remains largely unexplored is whether there are factors that facilitate (or hamper) a girl's participation in school after marriage. In other words, once married, are certain girls more likely to continue their education than others?

Research Question 2: Does the effect of marriage on school attendance vary by the girls' relative household wealth, age, urban or rural residence (locality), and educational attainment?

Finally, we explore the effect of early childbearing alongside the effect of marriage, using the case of Malawi, the country where the 1993 Readmission Policy officially permitted girls to return to school one year after childbirth, but where child marriage and school dropout continue to plague the education system to this day (Samati, 2013).

[1] Gender parity index, or the ratio of the indicator value (e.g., gross enrollment rate) for females over the indicator value for males, was 0.93 for gross enrollment rate in primary school in 2010 for the region.

FIGURE 1: IN SUB-SAHARAN AFRICAN COUNTRIES WITH HIGHER INCIDENCES OF EARLY MARRIAGE, SECONDARY SCHOOL AGE GIRLS ARE MORE LIKELY TO BE OUT OF SCHOOL[2]



Research Question 3: How does the effect of childbirth on a girl's school participation compare to the effect of marriage?

In the first section of the paper, we explore the effects of marriage on school participation in nine countries, as separate models and as a region (with country-level variance controlled). Figure 2 shows the countries included in the regional analysis. Overall, our findings suggest that *marriage and schooling appear largely incompatible in the region at the present.* Across the region, "average"[3] married girls are roughly 20 times as likely to be out of school as their unmarried peers, and the effect varies slightly by relative household wealth, age, and educational attainment, but not by locality. We then focus on Malawi and find that, while both marriage and childbirth impact whether a girl stops attending school (an event we term school exit), marriage is a much stronger predictor of school exit in the year following the event than childbirth (which predicts nonparticipation more strongly in the year the child is born).

[2] Out of school rates come from EPDC extractions of DHS and MICS surveys and use the most recent available survey from 2002 to 2011. Marriage rates come from DHS and MICS surveys from 2002 to 2011 as reported in UNICEF's The State of the World's Children 2013. Marriage rates are the percentage of young women ages 20-24 who were married/in union before age 18.
[3] Average on all covariates, including wealth, age, educational attainment. The locality variable is set to urban.

FIGURE 2: MAP OF COUNTRIES INCLUDED IN THE STUDY

BACKGROUND

Early Marriage and Education

Arguments from research and advocacy groups against early marriage generally approach the issue from health, human rights, and/or economic perspectives (Jenson & Thornton, 2009; Walker, 2013). Health arguments stress that young girls are often not physically ready for pregnancy and childbirth (which often follow marriage), that they are less equipped to defend against sexually transmitted diseases, and less prepared to raise healthy children (Otoo-Oyortey, 2003; UNFPA, 2012). Human rights arguments observe that early marriage violates the rights of children, including rights to protection against violence and to education, and women's sexual and reproductive rights (Ibid.). Economic arguments maintain that the low skills and missed earnings potential from girls who marry young stifles individual opportunities for marketplace participation and national economic development (Vogelstein, 2013; UNICEF, 2001).

These arguments establish early marriage as an alarming multi-dimensional issue, one that intersects at many points with education and particularly girls' education efforts. Research points to common factors and circumstances that constrain educational participation and maintain early marriage (and child-bearing) practices, such as school accessibility, school water and sanitation, socioeconomic factors, social norms that devalue women, poverty, and rural residence (Lloyd & Mensch, 2008; UNFPA, 2012; UNICEF, 2005). Moreover, education helps mitigate the negative effects often associated with early marriage. Educated girls are more likely to be healthy, have healthy families, enjoy a sense of personal empowerment, understand their own rights, and have greater skills and more economic potential. Even more directly, higher levels of education are often linked to lower incidences of marriage (UNESCO, 2014), while early marriage is considered effectively incompatible with continued formal education given the new set of responsibilities that require girls to care for a new household and, possibly, for children (Jenson & Thornton, 2009).

This study contributes to the existing literature by focusing on current school participation of girls of school-going age and attempting to disentangle the influence of wealth, locality, and age of the girl from the effects of marriage on her school attendance in a given year. We explore several angles in our analysis, and offer a way of aggregating data at the regional level in order to examine the issue of early marriage across a larger population, albeit with controls for unobserved country-level variance. Using a single country case, we further examine the effects of childbirth on the likelihood of school exit for married girls.

Regional Policy Context

At the regional level, early marriage rates (marriage below the age of 18) have changed little over the past several decades, remaining between 50 and 60% across Sub-Saharan Africa (Jenson and Thornton, 2009). Regional averages, however, mask country-specific progress in reducing the incidence of teenage marriage, such as in Kenya and Zimbabwe (Ibid.) and Rwanda (UNFPA, 2012). The African Charter on the Rights and Welfare of the Child (ACRWC) adopted in 1990 protects girls and boys below the age of 18 from marriage,[4] establishes the right of children to education, and encourages support to girls who become pregnant to help them complete their education.

All nine countries in our analysis have signed and ratified the ACRWC (African Union, 2011). Table 1 shows the legal age at marriage in the countries included in our analysis, according to UNFPA data. With the exception of Rwanda and Burundi, which had no data, all countries established 18 as the minimum legal age to marry without parental consent. With parental consent, however, the legal age drops to as low as 14, in Tanzania, and possibly lower elsewhere. The standards set by the ACRWC remain aspirational, as marriage laws are not always enforced, marriage legislation is sometimes contradictory as the legal age a child becomes an adult may not be clearly stipulated,[5] and local traditions and customs favoring child marriage are entrenched and slow changing. This means that early marriage persists to the detriment of girls, and fourteen years after the adoption of the ACRWC, the importance of continued efforts in exploring its full impact on society – and putting an end to this harmful practice – is as high as ever.

[4] In this study, we only focus on the effect of marriage on girls ages 13-17.
[5] For examples in Malawi and Tanzania, see http://www.girlsnotbrides.org/country/malawi and www.forwarduk.org.uk/download/194.

TABLE 1: LEGAL MARRIAGE AGE IN SELECTED SUB-SAHARAN AFRICAN COUNTRIES WITHOUT/WITH PARENTAL CONSENT.

	Female	Male
Burundi	no data	no data
Kenya	18/16	18/NA
Madagascar	18/NA	18/NA
Malawi	18/15	18/15
Mozambique	18/16	18/16
Rwanda	no data	no data
Tanzania	18/14	18/14
Uganda	18/16	18/NA
Zimbabwe	16/NA	18/NA

Source: UNFPA

METHODOLOGY

We use household survey data for a group of Southern and Eastern African countries for the years 2008-2011 and run logistic regressions examining the relationship between early marriage and school participation.

We address the first two research questions using a pooled dataset combining household survey data for girls ages 14-17 from Burundi, Kenya, Madagascar, Malawi, Mozambique, Rwanda, Tanzania, Uganda, and Zimbabwe to examine the relationship between the girls' marital status and their likelihood of school participation, controlling for important background factors, such as wealth, age, locality, and attainment (the number of years of education a girl completed prior to marriage), as well as unobserved country-level variance.

Pooling the dataset at the regional level allows us to explore the phenomenon in a broader population, using a larger aggregated sample, and hence, the ability to control for a greater number of background factors and conditions. We also explore whether these background factors moderate or amplify the effect of marriage on school attendance by entering a series of interaction terms which are products of the measure of marriage and each of the background factors that we hypothesize have a potential modifying effect on the likelihood of a married girl's dropout. Though these interaction effects are only possible to explore with a larger dataset (hence the pooling), we also fit country-specific regression models without interaction terms, and present results in the Appendix. We believe that comparisons of point estimates across country-specific models should be done only with extreme caution, due to small n of married girls of the 14-17 age group in each country. We therefore draw the focus of the regional analysis to the estimates and magnitudes of marriage effects aggregated to the region, from the pooled dataset, with a full understanding of the variability of these magnitudes across individual countries.

To explore the third question about marriage versus childbirth, we leverage the depth of the Malawi household survey data (a time span over two years) to focus on shifts in school participation following marriage AND childbirth as major life events in a girl's life, coding these life events separately for each year.

Data

Our analyses draw on Demographic and Health Surveys (DHS).[6] In order to create country-level datasets with girls' combined educational and marriage histories in a single location, we merged information from the household roster dataset, which contains school attendance history for individuals aged 5-24, and the women's dataset, which includes marriage histories for women ages 15-49.[7] Finally, we merged the datasets for each country together resulting in a subpopulation of 18,796[8] 14-17 year olds.

In order to correctly identify the population of interest (girls ages 14 to 17 for the regional analysis, and 13 to 17 for Malawi), we recoded the DHS age variable to adjust the girl's age to what it was at the beginning of the academic year in each country, rather than at the time of survey enumeration.[9] The data used in the regional analysis focus on a single year of attendance data. The Malawi DHS, used for the Malawi case study, sampled an unusually large number of women and includes attendance information from two consecutive academic years, 2009 (academic year 1) and 2010 (academic year 2).

[6] DHS conducts household interviews and gathers information on the demography, health, nutrition, and the education of a population, presenting results that are nationally representative.

[7] For all countries in the study, surveys administered the detailed women's interview to all women aged 15-49 from the household questionnaire, so a one-to-one merge was possible.

[8] Of these 18,881 observations, 18,796 were eventually included in the regression analysis because some observations were missing information for key variables.

[9] The women's questionnaire, from which marriage information is drawn, is administered only to girls and women ages 15 to 49. By adjusting the ages for the time lapse between the beginning of the school year and the time of survey enumeration, we were able to capture girls who were 15 at the time of the survey but 14 at the beginning of the year.

Survey weights: While the Malawi analysis uses DHS's standard, relative (or normalized) weighting, the standard weights are inappropriate for datasets that combine several countries (ICF International, 2012). We performed a weight adjustment transforming relative weights to raw weights for each country. See Appendix A for more information about the data, weighting, and approach used in the age adjustment.

Population of interest: As noted above, we focus on girls ages 14-17 for the regional part of the analysis, as 14 is the youngest we are able to consider with the available data and 17 is the theoretical entry age for the last grade of secondary in some of the countries included (others have higher ages).[10] For the Malawi case study, we are able to look at girls ages 13-17 because the reference school year occurred one year earlier than in the other country datasets. The richness of this dataset allows for a time-sensitive view of the effects of marriage and childbirth on shifts in school participation. In this country case, we focus on girls who reported attending primary or secondary school during the first of two academic years, and who had never married or given birth to a child before the beginning of that year. Furthermore, 13-17 year olds who reported attending the last grade of secondary school were excluded from the subpopulation.[11]

Variables

Dependent Variables

School participation: We define school participation differently for the regional analysis and for the Malawi case study. In the regional analysis, we use a measure of school participation in the most recent school year (the school year is identified explicitly in each survey questionnaire) as the binary dependent variable. In the Malawi case, the availability of two years of data allows us to go further, focusing on school exit. Here, we look at shifts in school participation from academic year 1 to academic year 2 (with the dependent variable being school participation in year 2) for girls who were married and/or had children at some point before or during the period in question, as compared to girls who were never married and never had children. The variable indicates whether girls who attended school at some time during academic year 1 did or did not go on to attend school at any time during academic year 2.

Independent Variables

Marriage and childbirth: Our central independent variables in both analyses are life events – marriage in the multi-country analysis and both marriage and childbirth in the Malawi analysis. We consider a girl married if she is either officially married or cohabitating. In the regional part of the analysis, a girl's marriage may fall at any point before the end of the school year in question, while the Malawi dataset allows us to focus on marriage occurring after the start of the first school year (Year 1) – and we restrict the dataset to girls who had not been married before Year 1.[12]

Covariates: In addressing Research Question 2, we use background measures, such as the young woman's educational history (how many years she was able to complete in school), which is predictive of her current educational participation status, (i.e. whether or not she is attending during the time in question), as well as age, locality, and socio-economic status (captured through the DHS wealth index). We chose these independent variables because of their established relationship with both school participation and early marriage (EPDC, 2007; EPDC, 2009; UNESCO, 2012; Lloyd & Mensch, 2006; Jensen & Thornton, 2009).[13] The regional analysis also includes country dummies to control for unexplained country-level variance, as well as dummies for the year of survey enumeration.[14] Table 1 provides an overview of the variables used in each regression analysis. Frequency tables and the coding for each variable along with data notes are available for both the multi-country analysis and the Malawi analysis in Appendix C.

[10] See Appendix for information about the theoretical entrance ages and durations of school levels in each country.
[11] In Malawi, the official entry age for this last grade of school is 17. Because our subpopulation of interest is 13-17 year olds and very few students complete their education career 'on time', excluding young women beginning the last grade of secondary reduced the subpopulation for Malawi by 2.1%.
[12] As a result of this restriction, 27 observations were coded as missing.

TABLE 2: VARIABLES USED IN REGIONAL ANALYSIS AND MALAWI CASE STUDY

Variables	In Regional analysis	In Malawi case study
School participation: attendance	Yes	Yes
School participation: retention/ exit	No	Yes
Marriage	Yes, at any point	Yes, by year (Year 1 and 2)
Childbirth	No	Yes, by year (Year 1 and 2)
Age (in one-year increments)	Yes	Yes
Locality: urban/rural	Yes	Yes
Wealth (DHS index of relative wealth)	Yes	Yes
Educational attainment: grades completed	Yes	Yes
Country dummies	Yes	N/A
Year of survey	Yes	N/A

Methods

The first step in our analysis was the construction of the pooled dataset, using nine DHS surveys. In re-aligning the survey weighting structure to the cross-national sample, we followed MEASURE DHS recommended methodology for denormalizing survey weights. By pooling discrete country surveys, we are in essence treating the region as a special case of "multipopulation sample" (Kish, 1994), much like country-level analyses sometimes treat subnational units (i.e. states or provinces) mere parts of a larger whole (see Skinner & Mason, 2012 for more detail on the methodological treatment of country weights in cross-national regressions).

With the regional dataset constructed, we begin the analysis with *descriptive statistics* across the variables of interest, showing the extent of the problem in average early marriage rates, as well as rates of school attendance of girls ages 14-17. We further break down school participation rates across the key demographic dimensions captured by the independent variables, such as the girl's age, wealth status, educational attainment, and locality.

The descriptive analysis provides an initial look at the multitude of factors that influence school attendance. It is followed by *logistic regression analysis* with school participation as a binary outcome variable, which allows for examining the combined influence of several factors on school participation, in response to Research Question 1. We test several specifications of regression models, starting with a simple binary model with marriage as the sole predictor, moving to more saturated models that account for the key background variables identified above. Further, addressing Research Question 2, we test the hypothesis that background factors influence the magnitude of the dependency of school participation on marriage through a *logistic regression with interactions* between marriage and each of the background measures (age, educational attainment, locality, and wealth).

[13] Certainly additional factors, such as accessibility of schools and school quality (Lloyd & Mensch, 2008), are associated with school participation, but they were not possible to include given the scope of the analysis and limitations of the survey data.
[14] Survey years were entered as dummies for additional control. While data and literature show that incidence of marriage and school attendance patterns do not change rapidly year-to-year, simple control accounts for unknown and unobserved variance associated with surveys conducted in each of the years in question.

For the Malawi case study, which we use to address Research Question 3, we run a logistic regression model examining the effects of marriage and childbirth on school participation over a two-year time span covered by the household survey. Effects are modeled separately with discrete coding of these events in each of the two years, making it possible to distinguish how the timing of marriage or childbirth affects school exit in Year 2, and compares the effects of these two life events.

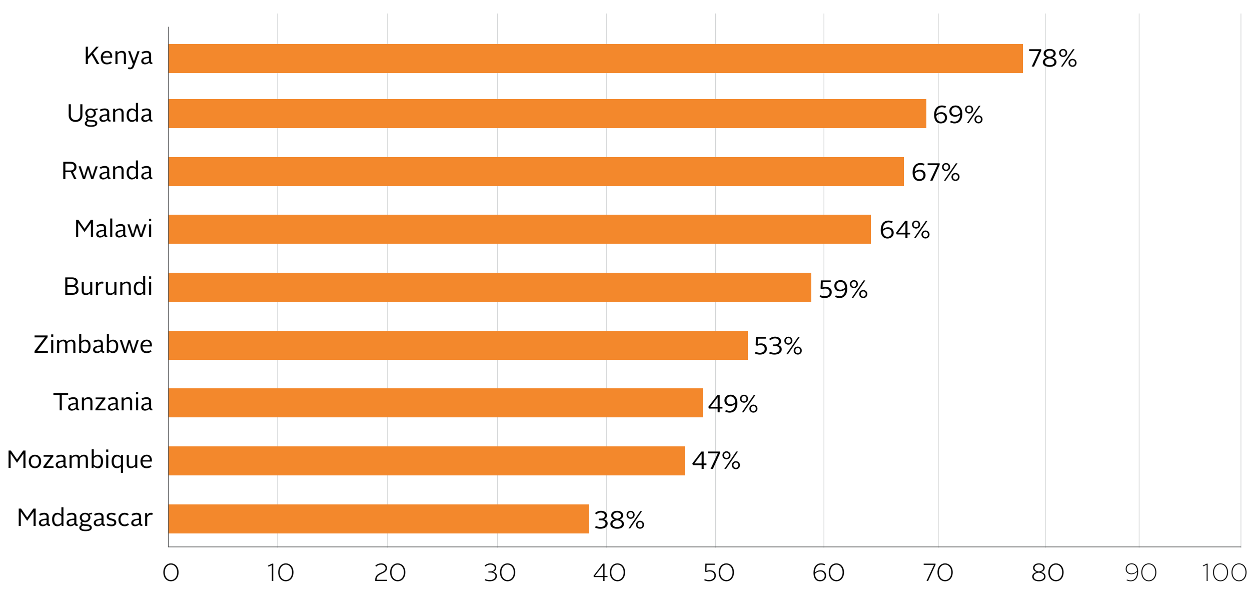
RESULTS

Descriptive analysis

Attendance rates. In Figure 3, we present school participation rates for 14-17 year olds by country. School participation in this part of the analysis is proxied as attendance "at least one day" during the school year in question.[15] Net attendance rates, which represent the girls who reported attending school as percentage of the population of girls in that age group, range substantially across the countries included in the analysis, with only 38% in Madagascar to 78% in Kenya, with the average regional net attendance rate of 60%.

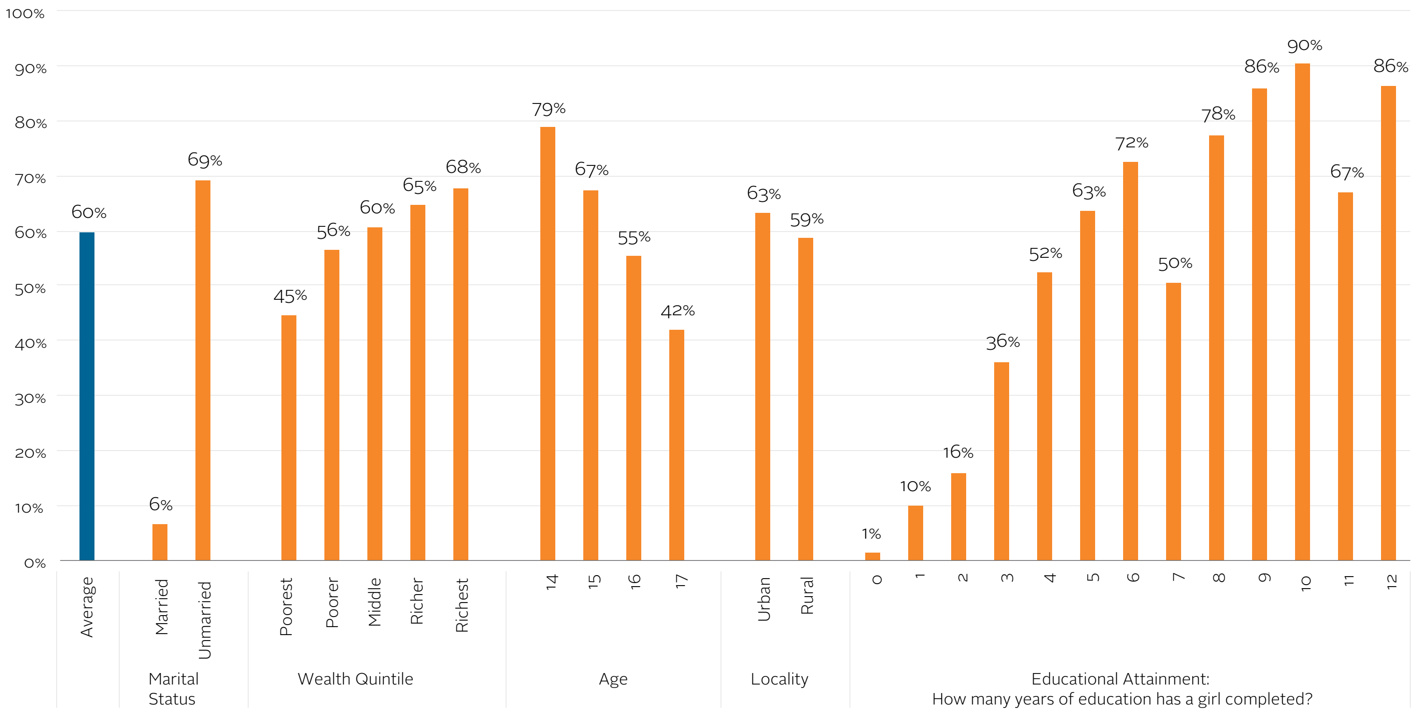
Figure 4 looks across the region and presents average net attendance rates by demographic characteristics. Notably, attendance rates are substantially higher for unmarried girls than married girls, with only 6% of married girls attending compared to 69% of unmarried girls. Attendance rates also vary, though less severely, across other characteristics, decreasing steadily with age and increasing with wealth and higher educational attainment (except for notable drops at grade 7 and grade 11, which mark the beginning of lower and upper secondary school in several countries in the study).

FIGURE 3: NET ATTENDANCE RATES FOR 14-17 YEAR OLDS VARY BY COUNTRY

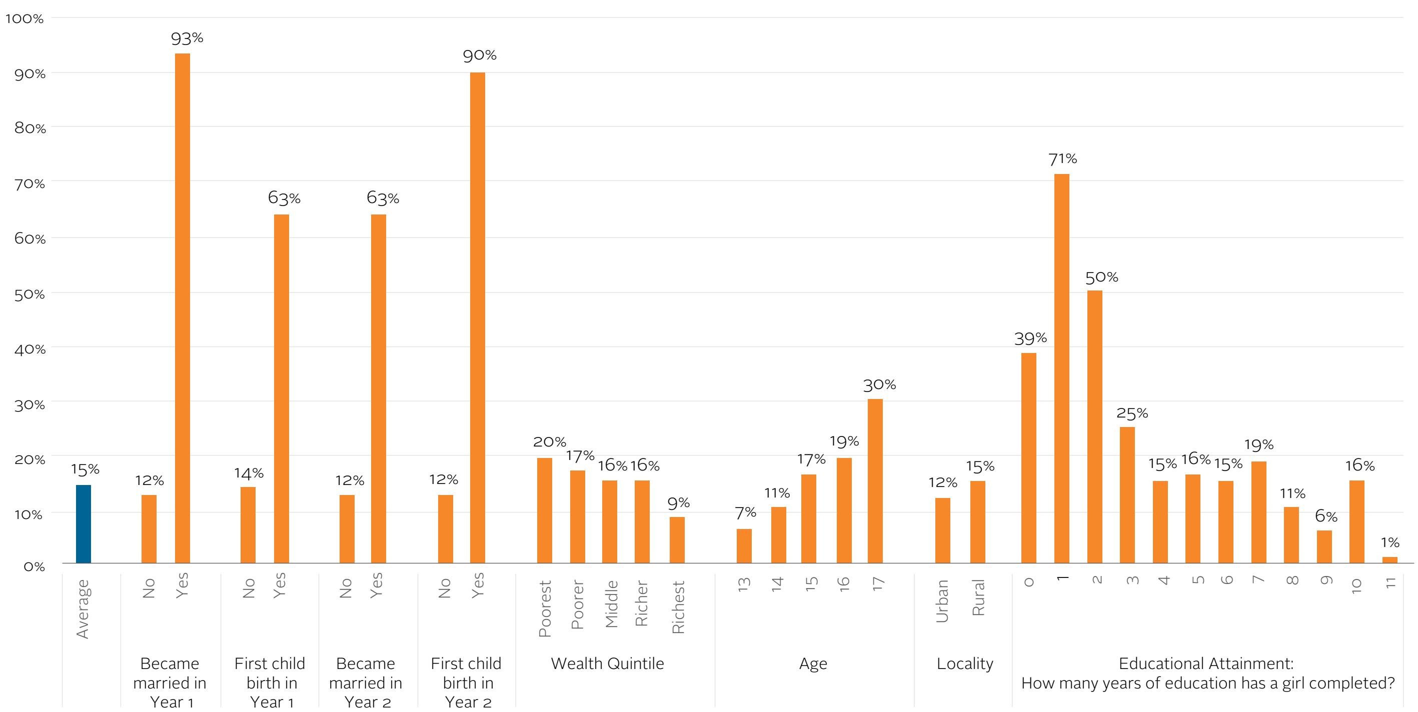


[15] Notably, this measure of school attendance is closer to a definition of "school enrollment", in that it registers presence at least once. This is a weakness of all secondary data sources that fall short of measuring school attendance over a prolonged period of time.

FIGURE 4: ATTENDANCE RATES FOR 14-17 YEARS OLD GIRLS FOR SOUTHERN AND EASTERN AFRICA REGION, BY DEMOGRAPHIC CHARACTERISTIC[16]



FIGURES 5: SCHOOL EXIT RATES FOR 13-17 YEARS OLD GIRLS IN MALAWI



[16] Average rates across Burundi, Kenya, Madagascar, Mozambique, Malawi, Rwanda, Tanzania, Uganda, and Zimbabwe

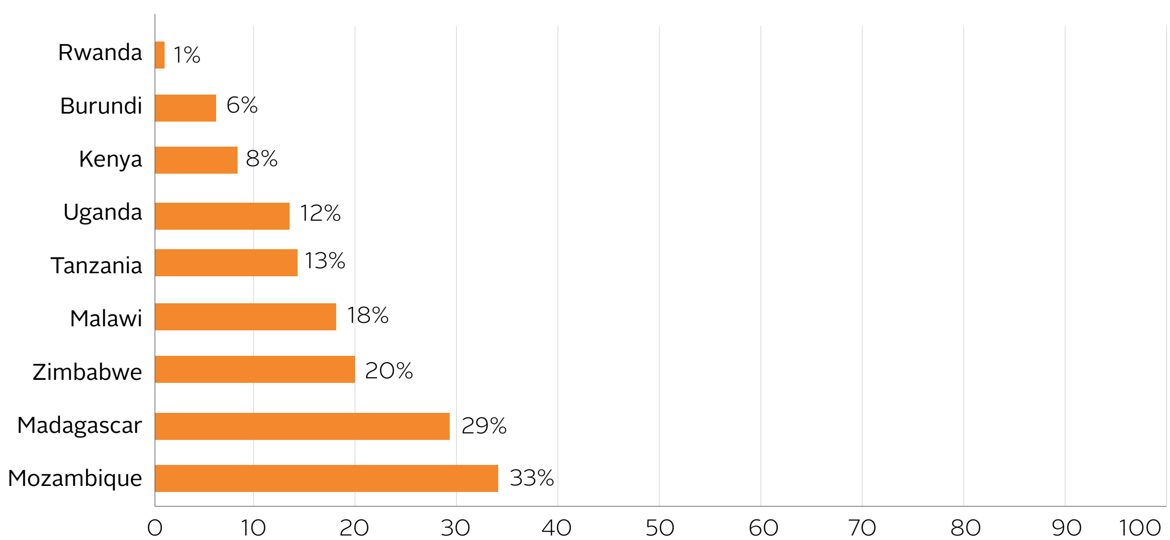
Attendance rates are slightly lower for rural girls (59%) than urban ones (63%). Given that these are relatively close estimates and knowing that locality trends are often country-specific, we compare attendance rates by country and locality in Appendix C. While the general trend across countries indicates rural disadvantage, sometimes we see that the relationship can vary in its direction (for example, greater urban disadvantage in Kenya) and magnitude (for example, differences in Burundi are negligible but rural disadvantage is relatively high in Mozambique).

Next, we present descriptive statistics from our Malawi dataset, where we focus on a more specific population of girls who attended at least one day during one academic year and look at what percentage did not attend any days the following year, an event we term school exit. Looking at group disparities, school exit rates differ most dramatically for girls who married or gave birth between the start of the first and end of the second academic year. Nearly all (9 out of every 10) girls who married during the first school year left school compared to just over 1 in every 10 girls who did not marry. Of girls who gave birth in academic year 1, 63% left school, a lower percentage than girls who married, but still alarmingly high, especially compared to a school exit rate of 14% for girls who did not give birth. For those who married in year 2, 63% left school—a lower percentage than those who married during the previous school year. Of girls who gave birth during year 2, 90% left school, a higher percentage than those who gave birth in year 1. We also see school exit rates rise with increases in poverty, with age, for rural girls, and as an overall trend associated with higher educational attainment.

Early marriage. Across the region, early marriage is most prevalent in Madagascar, Mozambique, Zimbabwe, and Malawi, all of which surpass the regional average of 15%, while in Kenya, Burundi, and Rwanda, marriage rates among girls 14-17 are all below 10%. Of the nine countries in the analysis, early marriage rates are lowest in Rwanda, at 1%, which showed a dramatic decrease in recent years (UNFPA, 2012). Since policies and local practices that influence marriage and schooling vary by country (if not by community), we control for unobserved country-specific variance in our regional regression analysis.

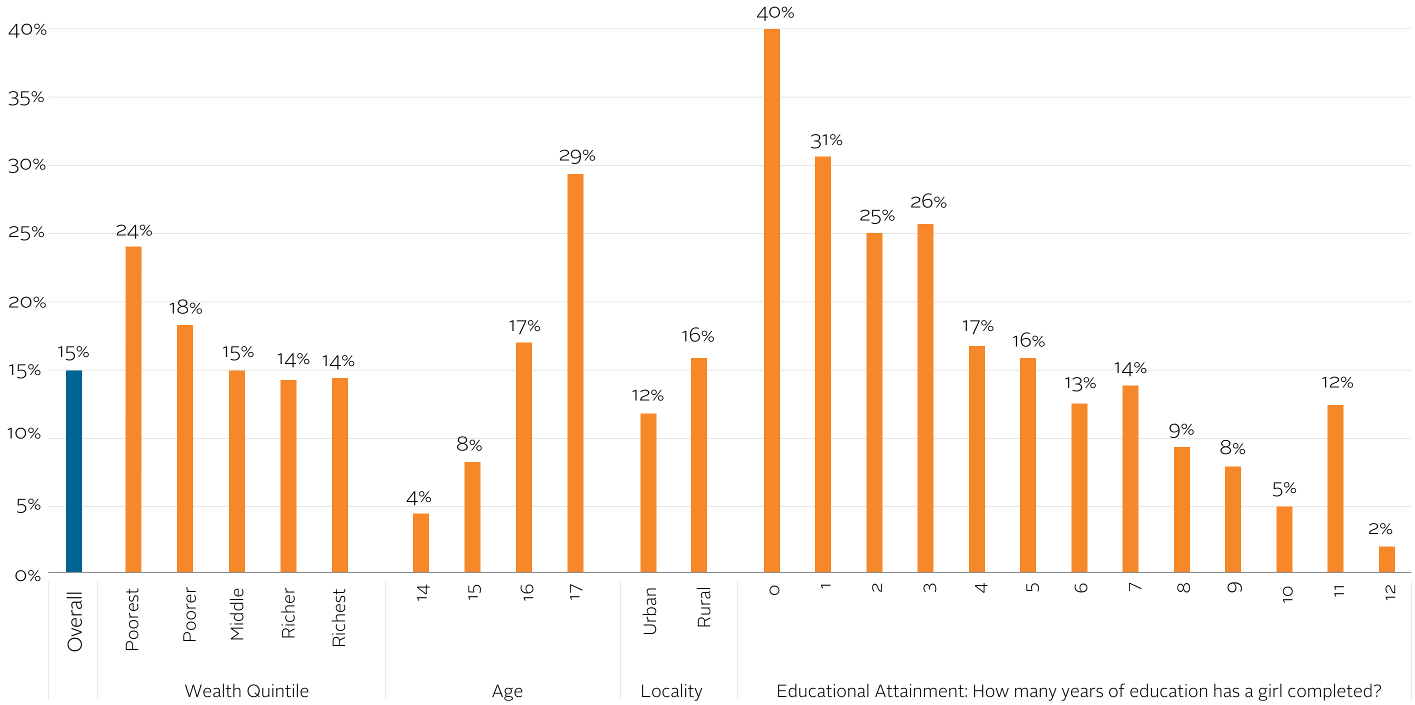
Looking at the distribution of marriage rates by demographic characteristic, we see that across the region, poor and rural girls are more likely to be married than their wealthier and urban peers.[17] Older girls are also more likely to be married; however, because there are fewer married girls among those with more than four years of completed education, we may hypothesize that marriage may have prevented the girls that got married at a younger age from continuing to attend school. Overall, categories of girls with lower attendance rates typically have relatively higher marriage rates.

FIGURE 6: MARRIAGE RATES FOR 14-17 YEAR OLD GIRLS BY COUNTRY



[17]The relationship of locality to marriage varies by country and our regional analysis masks country-specific differences. See Appendix C for rates by country by locality.

FIGURE 7: MARRIAGE RATES FOR 14-17 YEAR OLD GIRLS BY DEMOGRAPHIC CHARACTERISTIC, AVERAGE FOR SOUTHERN AND EASTERN AFRICA REGION



The descriptive analysis for both the regional and Malawi datasets suggests that life events as well as background characteristics like wealth, age, locality, and prior educational experience are related both to school participation as well as the likelihood of early marriage. However, these factors are also interrelated: rural populations tend to be relatively poorer, and wealthier groups also are more likely to gain, on average, higher levels of educational attainment. Regression analysis, described in the next section, helps us to isolate the discrete influences of these factors on school participation and better understand the relationship between early marriage (and childbirth) and education.

Regression Analysis

We use logistic regression models to estimate the likelihood of girls' school participation as a function of early marriage, accounting for important background characteristics known to correlate strongly with both marriage and educational participation (e.g., wealth, locality, educational attainment, age). As explained above, for *Research Question 1*, we begin with a series of logit models that look at trends across the nine countries in the East and Southern Africa region, with early marriage as the key predictor variable, and background characteristics as independent controls. Moving on to *Research Question 2*, we test whether these characteristics moderate or amplify the effect of early marriage on school attendance, using a set of interaction terms. In other words, we explore whether married girls from particular circumstances, such as poor households, experience different (more or less extreme) changes in school participation than married girls from different circumstances, such as wealthier households. For each background characteristic, we create an interaction term as the product of the marriage indicator and the moderating variable in question. Finally, for *Research Question 3*, we turn to Malawi, further refining our understanding of the relationship of life events on attendance and considering the effect of marriage in relation to childbirth.

Research Question 1: Regional analysis using a series of logistic regressions

We fit a series of logit regression models testing the relationship between early marriage and attendance, working with lower-order effects of the variables (i.e., no interaction terms). We start with a simple logit model with only one independent variable, marital status. We then refine the model by adding the other predictors of school participation, while observing changes in the effect of marriage on attendance. All variables in our regression models are centered[18], to improve ease of interpretation of the intercept and the coefficients.

Table 3 presents the results from these regional models as odds ratios – or the ratios of the odds of unmarried girls attending school over the odds of married girls attending school when all other variables are held constant. The complete results are presented in Table E in the Appendix. All of our lower-order models are significant at $p < .001$. Given that the regional dataset combines data from several country surveys, to obtain a measure of the overall goodness-of-fit we ran the F-adjusted mean residual test for complex survey data (Archer & Lemeshow, 2006), and were able to reject the overall null hypothesis for all of the models.

The early marriage effects are significant at $p < .001$[19] in all lower-order models, and all results consistently point to dramatically lower attendance among married girls and, across all models, indicate that the influence of other predictors remains modest in comparison to marriage. However, as Table 3 demonstrates, the magnitude of the marriage effect fluctuates with the addition of other predictors. In a model with marriage as the only predictor, the odds ratio for marriage is 32.4, meaning that the odds of attending for unmarried girls are 32.4 times the odds of attending for married girls. The odds ratio decreases as we control for wealth, age, locality, and educational attainment, suggesting that these factors are responsible for some of the covariance between early marriage and school attendance. When we add a set of country dummies into our regression (with Malawi as a reference category), the odds ratio for marriage rises to 23.5, which implies that unobserved country-level variance reduces the strength of the marriage effect.[20]

From these models, we conclude that marriage is a significant and influential predictor of attendance outcomes—married girls are dramatically less likely to attend than their unmarried peers. Additionally, inclusion of other variables, particularly wealth, age, locality, attainment, and our country controls, provide valuable refinements to our model. For country-specific results of the models, see Appendix F. Next, we proceed with testing how these predictors affect the magnitude of the marriage effect, using a logit regression model with interaction terms to address RQ2.

Research Question 2: Regional analysis with interaction effects

For this question, we build a logit model that, in addition to the main effects of marriage and background characteristics on the likelihood of school attendance, includes interaction terms between marriage and each of the other predictors. The results of this model are presented in Table 3. In terms of overall model fit, model statistics are strong ($F_{18,\ 4405} = 98.2$, $p < 0.001$, F-adjusted mean residual test[21] is significant at $p<.01$). As the table shows, adding interaction terms to the equation adds only modestly

[18] Centering involves setting the zero value of the variable to the mean, such that the intercept of the model equals the value of the dependent variable (i.e. attendance) when the observation is exactly "average" for the sample.
[19] Throughout the paper when we reference statistical significance, we use a significance level of 0.05 (critical value of t =1.96) with a two-tailed t-test unless otherwise specified. However, it is very important to remember that statistical significance is not a dichotomy, and there is no dramatic change in importance of an observed effect between p values of 0.05 and 0.06 or even 0.09. Further, for one-tailed t-tests (meaning that the null hypothesis is that the effect is not positive or not negative, rather than it's zero), the critical values of the t statistic at p<.05 would shift to 1.645, and consequently a probability of p<0.10 in a two-tailed test corresponds to the probability of p<0.05 in a one-tailed test.

TABLE 3: ESTIMATED ODDS RATIOS OF MARRIAGE FROM A SERIES OF LOGISTIC REGRESSION MODELS, REGIONAL DATASET (NINE COUNTRIES)

Model	Regression Model	Estimated Odds Ratio of School Attendance	95% Confidence Intervals	p
Model 1	Logistic Model with Marriage as the only predictor	32.4	[26.3 - 39.9]	< .001
Model 2	Logistic Model with Marriage and Wealth only	30.4	[24.7 - 37.5]	< .001
Model 3	Logistic Model with Marriage, Wealth, and Age only	23.9	[19.4 - 29.6]	< .001
Model 4	Logistic Model with Marriage, Wealth, Age, and Locality only	23.9	[19.4 - 29.6]	< .001
Model 5	Logistic Model with Marriage, Wealth, Age, and Attainment only	22.1	[17.4 - 27.9]	< .001
Model 6	Logistic Model with all main predicators and controls for Country	23.5	[18.1 - 30.4]	< .001
Model 7	Logistic Model with all lower-order predictors and controls for Year and Country	23.6	[18.2 - 30.6]	< .001

**Cell entries are the ratios of the odds of school attendance for unmarried girls over the odds of school attendance of married girls, controlling for the predictors in the model, with 95% confidence intervals and p values.*

to our understanding of the relationship of marriage to attendance.

The findings presented in Table 3 support the idea that some of the characteristics (notably attainment and age) exert independent influence on attendance, and further suggest that school participation patterns differ slightly for married and unmarried girls with increases in age, attainment, and possibly also wealth. Below, we review the findings from the model in greater detail and provide predicted probabilities for attendance for different groups of girls.

Early marriage

The lower-order marriage coefficient has an odds-ratio of 19.3 and is statistically significant.[22] Unlike in the lower-order models where the odds ratio represents the main effect of marriage, the odds ratio here applies to a narrower population of girls. The ratio shows that the odds of an unmarried girl attending are 19.3 times the odds of a married girl attending where the moderating variables equal 0, i.e. for an urban girl of average age (15), wealth, and education (6 years). As we explore the modest importance of our interaction terms below, we see that the odds-ratio for our lower-order marriage variable often *roughly approximates* the main effect of marriage in our regression equation for the full subpopulation of girls in our analysis.

[20]Although certain country dummies are not statistically significant (meaning they are not statistically distinguishable from the reference category of Burundi), a Wald test on all country dummies suggests that we can reject the null hypothesis that, collectively, they are unrelated to attendance.
[21]Archer & Lemeshow (2006)

[22] When interaction terms are included from a model, the main significance of lower-order terms and interaction terms must be considered jointly to understand the significance. Here, when we discuss the significance of either lower-order or interaction terms separately, we are referring to the significance of the terms only rather than the main effect of the factor discussed.

TABLE 4: RESULTS OF LOGISTIC REGRESSION WITH INTERACTION TERMS

Variable	Estimated Odds Ratio	95% Confidence Intervals	p
Marriage*	19.31	[10.5 - 35.4]	< 0.001
Relative Wealth	1.12	[0.9 - 1.4]	0.3
Age	0.59	[0.5 - 0.7]	< 0.001
Locality	1.19	[0.6 - 2.3]	0.6
Attainment	1.54	[1.4 - 1.7]	< 0.001
Year	0.82	[0.6 - 1]	0.1
Marriage* Relative Wealth	0.84	[0.7 - 1]	0.1
Marriage* Age	0.81	[0.6 - 1]	0.1
Marriage* Locality	1.30	[0.7 - 2.6]	0.4
Marriage* Attainment	1.15	[1 - 1.3]	< 0.001
Country Dummies	Data not shown		
Constant	0.19	[0.1 - 0.4]	< 0.001

Model statistics: n = 18,881; $F(18, 4405) = 98.2$ ($p < .001$)

Cell entries are odds ratios, or multiplicative factors by which the odds of attendance change with each unit of the predictor variable. Cell entries for interaction terms are ratios of odds ratios for attendance between groups.

**The marriage variable codes unmarried girls as 1 and married girls as 0.*

Educational attainment and marriage

The lower-order (or main effect) educational attainment variable (measuring years of completed schooling) and the interaction term between marriage and attainment are both statistically significant. The lower-order term has an odds ratio of 1.5, a multiplicative factor by which the odds ratio for attendance changes for a married girl (the reference category for our marriage variable) for every additional year of education she has completed. In other words, the more years of education a married girl has completed in the past, the more likely she is to be actively attending in the present.

The interaction term, while statistically significant at $p<.001$, does not dramatically alter our understanding of the relationship of marriage and attendance. The odds ratio for the interaction term is 1.15 and the 95% confidence interval for the odds ratio does not include 1,[23] suggesting that the positive effect on attendance from having reached higher levels of education is slightly (15%) greater for unmarried girls – meaning that the disparity in the odds ratios of married versus unmarried girls attending widens with higher levels of attainment.

What does this mean in terms of the probability a girl is participating[24] in school, vs. the probability of that she is out of school? Because odds and odds ratios do not always provide a transparent answer to this question, we now turn to probabilities of attendance. Figure 8 presents the regression results as probabilities of attendance for unmarried girls by years of completed education, holding all other variables at their means. it highlights two important points. First, marital status is immensely important in predicting attendance. Second, for married and unmarried girls alike, more years of completed prior education mean greater probability of current attendance. This makes sense, because higher levels of attainment often signal a greater priority placed on the girls' education. At the same time, our model shows that even a girl who reached upper secondary school, an accomplishment that suggests she started school on time and progressed through the system efficiently, is far less likely to continue attending if married. Furthermore, the estimate for the interaction term points to *a slight increase in the likelihood of nonparticipation for married girls at higher levels* of educational attainment compared to unmarried girls at the same levels of attainment.

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[23] The relationship of odds ratios in a regression equation is multiplicative rather than additive, and wherever the odds ratio is 1 there is no impact on the resulting estimates from the regression equation.
[24] Again, participation is defined as attendance for at least one day.

Age and marriage

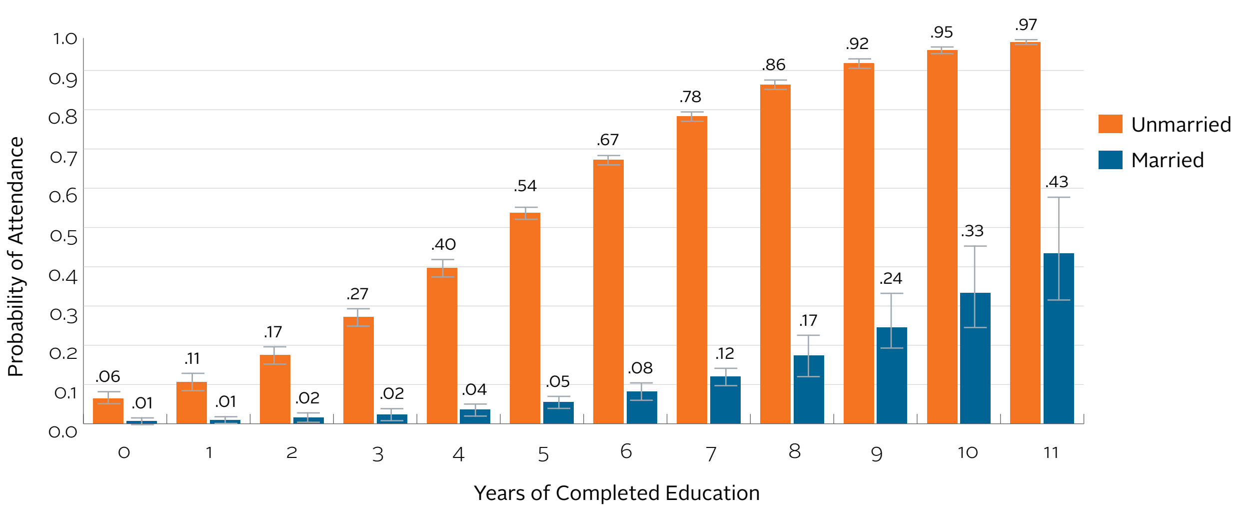
The lower-order age variable is statistically significant and has an odds ratio of 0.59. An odds ratio below 1 implies that the relative odds of married girls attending school decreases with age – in this case, by 41% with each year. The interaction term of marriage and age has an odds ratio of 0.81, *reducing the difference in the odds of attendance* between married and unmarried girls with each year of age; but with high standard errors, does not pass the conventional levels of statistical significance (p=.10). As its 95% confidence interval includes 1, the effect of age on attendance may well be the same for married and unmarried girls. As with attainment, the lower-order terms capture most of the influence exerted by both marriage and age. The point estimate of the interaction term indicates that the negative effect of marriage on attendance is more pronounced for younger girls (20% less associated with each year of age) – however, due to the high amount of error variance, we are unable to conclusively rule out that this amplification effect of age on marriage is not random.

Figure 9 presents predicted probabilities of attendance by marital status and age from our regression equation, holding all other variables at their means. In short, the figure shows: 1) older girls are less likely to attend school; 2) the effect of marriage on attendance creates a tremendous educational disparity between married and unmarried girls of any age; and 3) the point estimate of the interaction term suggests that *younger girls are more likely to stop attending if married* than older girls; however this interaction effect is inconclusive.

Locality and marriage

Neither the lower-order locality (rural vs. urban residence) variable nor the interaction term for locality and marriage are statistically significant. For the lower-order variable, this means the odds of a married girl from a rural area attending may be no different than the odds of a married girl from an urban area attending. For the interaction term, it means that hypothetical differences in attendance by locality may be the same for unmarried girls as married girls. Generally, we conclude that 1) locality has a smaller effect on girls' school participation, as seen in descriptive analysis, but it is overshadowed by other variables such as early marriage, and 2) the effect of marriage on attendance does not vary by locality at the regional level.

FIGURE 8: PROBABILITIES OF ATTENDING SCHOOL, GIRLS AGE 14-17, BY MARITAL STATUS AND EDUCATIONAL ATTAINMENT, WITH 95% CONFIDENCE INTERVALS



Wealth and marriage

While we know that wealth exerts a substantial influence on girls' school attendance, its influence for girls ages 14-17 is almost entirely accounted for by the measure of early marriage, as well as the control for educational attainment. Again, neither the lower-order wealth term nor the interaction term between wealth and marriage are statistically significant. Error variance is too great for the lower-order term to indicate a conclusive odds ratio estimate for married girls, on top of what is captured by marriage and the other predictors. The interaction term was estimated with greater precision (at $p<0.10$) and indicates that wealth may be moderating the effect of early marriage on attendance, dampening its influence at higher levels of wealth (by approximately 16% with each wealth quintile). However, because of the lack of statistical significance of the main term for wealth, the exact magnitude of the effect on school participation for married girls remains inconclusive.

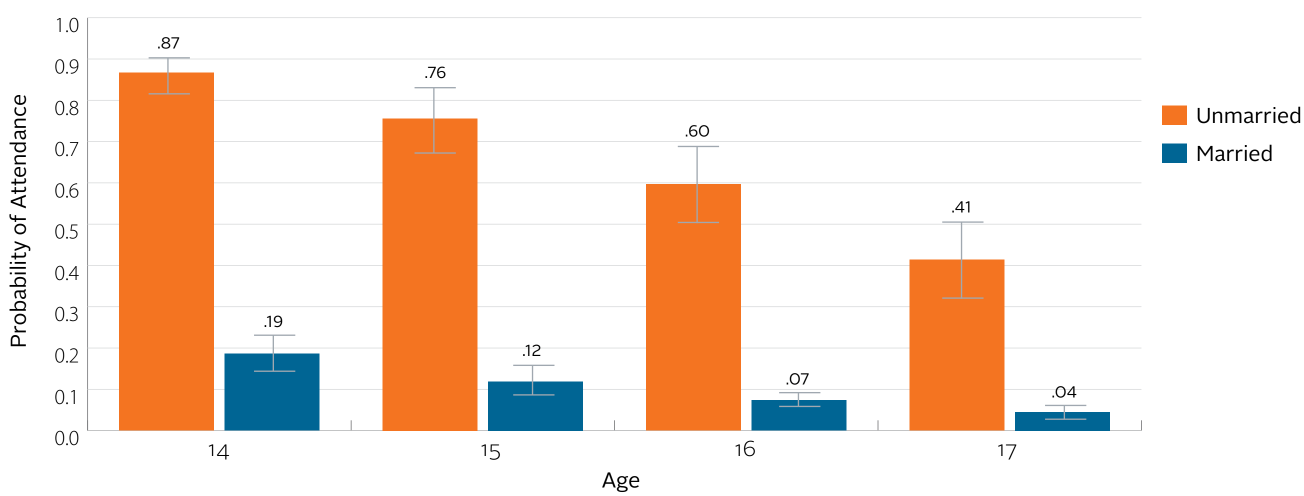
Summing Up: Research Questions 1 and 2

The multi-country regional analysis provides insights into the relationship of marriage and attendance and the role that demographic characteristics play in that relationship. We conclude that marital status is a very influential predictor of attendance, with *the odds of attendance dropping almost 20-fold for the "average"*[25] *girl who gets married.* Our findings regarding the moderating or amplifying influence of educational attainment, age, locality, and wealth, however, are less clear. Independent of marriage, current school attendance across the region improves with wealth, higher levels of completed schooling (within the age group of focus), and declines with age, while the influence of locality is not uniform across the region. There are indications that the *negative effect of early marriage on school participation is greater for younger and poorer girls*, although statistical power was insufficient to conclusively rule in favor of these amplifying effects. In the next section, we go into greater depth with Research Question 3 using the Malawi case.

Research Question 3: Childbirth and school exit in Malawi

In addressing Research Question 3, we turn to the Malawi dataset, which provides a two-year time span, allowing us to explore school exit as the dependent variable, with marriage and childbirth as the independent variables of central interest. The

FIGURE 9: PROBABILITIES OF ATTENDING SCHOOL, GIRLS AGE 14-17, BY MARITAL STATUS AND AGE, WITH 95% CONFIDENCE INTERVALS



[25] Average on all covariates, including wealth, age, educational attainment. The locality variable is set to urban.

TABLE 5: MALAWI LOGISTIC REGRESSION RESULTS

Variable	Estimated Odds Ratio	95% Confidence Intervals	p
Became married in Year 1	45.1	[16.3 - 124.5]	< 0.001
First child birth in Year 1	3.7	[1.3 - 10.8]	0.02
Became married in Year 2	12.8	[7.4 - 22.1]	< 0.001
First child birth in Year 2	40.7	[17.4 - 94.9]	< 0.001
Wealth	0.9	[0.8 - 1]	0.04
Age	1.6	[1.4 - 1.8]	< 0.001
Locality	0.7	[0.4 - 1.4]	0.30
Attainment	0.7	[0.7 - 0.8]	< 0.001
Constant	0.1	[0.1 - 0.2]	< 0.001

Model statistics: n= 3,157; $F(8, 798) = 28.1$ ($p < 0.001$)

Cell entries are odds ratios, or multiplicative factors by which the odds of school exit change with each unit of the predictor variable.

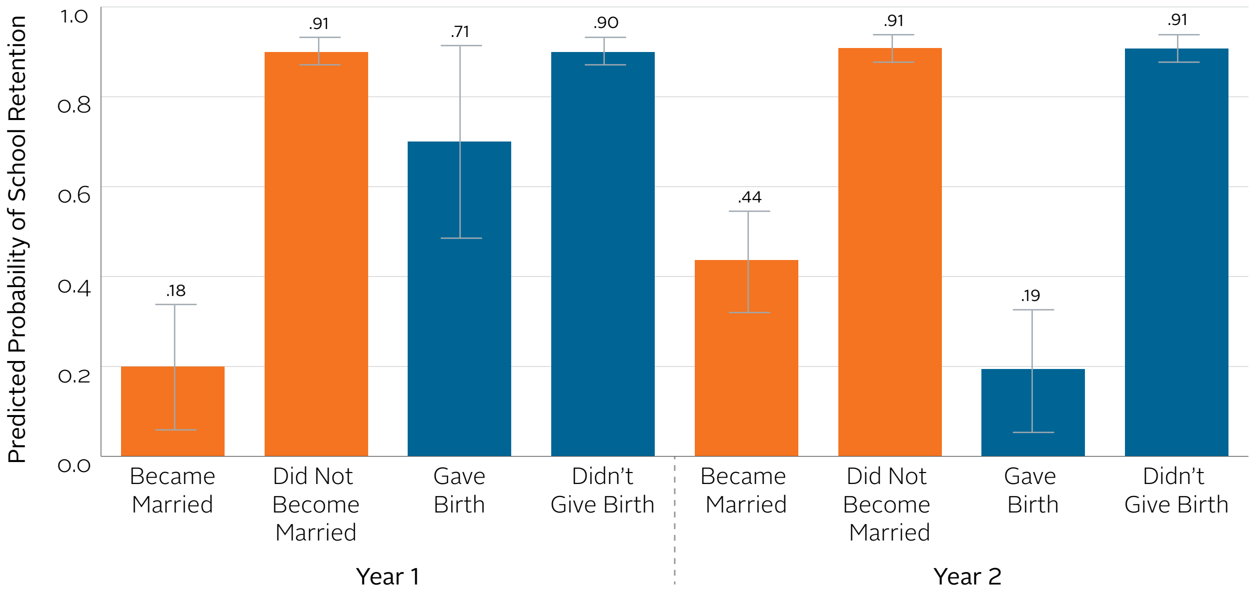
emphasis on school exit rather than attendance adds an additional dimension to our understanding of the effect of life events on school participation. Because of the ability to limit the timing of focal events – marriage and childbirth as well as school exit – to specific time periods, we can examine whether marriage itself, rather than background conditions, precipitates school exit for girls of secondary school age.

As in the regional analysis shown above, the results of the Malawi logistic regression (Table 5) show that *early marriage* is a strong and significant predictor of school nonparticipation (dependent variable is attendance in year 2), exerting greater influence on school exit than any other variable in the model. However, the magnitude of the marriage – school exit relationship in Malawi is far greater than any estimate that we have seen with the regional models. Controlling for the other factors in our model, the *odds of leaving school a year after marriage for a young woman in Malawi are 45 times those of a young woman who does not marry*, suggesting that marriage is almost completely incompatible with continued schooling. Even considering the very broad 95% confidence intervals surrounding the odds ratio, which stretch from 16.3 to 124.5, marriage undoubtedly has a strong negative impact on school-leaving. For girls that got married in the second of the two years covered by our analysis, the odds of being out of school are almost *13 times greater* than for their unmarried peers. Given the nature of the school participation measure (attendance for at least one day), we believe that the effect of marriage in year 1 on attendance in year 2 is the more accurate representation of this relationship. In year 2, the smaller odds ratio may in part be related to school attendance prior to the marriage event.

The influence of *childbirth* on school exit is less clear. The *childbirth* variable is statistically significant at the $p< 0.001$ level. The odds ratio for the variable in year 1 is 3.7, meaning that the odds of school exit for girls who gave birth in the prior year are 3.7 times those of girls who did not give birth. For girls that gave birth in Year 2, the odds ratio is over 40, making it nearly implausible that a girl who had a child may continue to attend at least once that year. While the influence of prior year childbirth on school attendance is more modest than marriage, it is still an important factor in school exit.

Figure 10 presents predicted probabilities of school retention (the inverse of school exit) in Year 2 for girls who did and did not become married and for girls who did and did not give birth in years 1 and 2, while holding all other variables at their means. At 18%, the probability of school retention for girls who became married during the previous school year is alarmingly low. This serves to: 1) solidify our finding from the regional analysis regarding the large general negative association between marriage and school participation; and 2) extends this finding to show that the events are temporally linked, therefore providing greater support for causality between marriage and school exit.

FIGURE 10: PROBABILITIES OF SCHOOL RETENTION IN MALAWI BY MARRIAGE AND CHILDBIRTH, GIRLS AGES 13-17 WITH 95% CONFIDENCE INTERVALS



School exit rates are relatively less dramatic for girls who gave birth in year 1 than for girls who became married. One, much of the variation associated with having children may be captured in the measure of marriage (half of the girls who had children were married). It could be that marriage comes with a new set of responsibilities that are deemed incompatible with school-going, whereas girls who give birth can rely on family networks to share in the responsibilities of child care, particularly if they are not married and not living with their husband's family. While the probability of remaining in school for girls who gave birth in year 1 appears relatively high at 71%, it is difficult to compare probabilities of school exit between those who did and did not give birth as the ranges of the 95% confidence intervals overlap.

The situation changes when we look at girls who married or gave birth in year 2. With a retention rate of 44%, girls who married in year 2 were more likely to have attended school at some point in the second school year than girls who married the previous year. Girls who gave birth in year 2, on the other hand, were less likely to attend in year 2 than those who gave birth the previous year (19% compared to 71%).

Overall, both childbirth and marriage are highly predictive of school exit, and are potentially important policy problems for policymakers to address. Furthermore, by controlling for background conditions and – in the case of the regional model, for unobserved country-level variance – we establish the argument that early marriage is in fact, a deterrent of school participation.

CONCLUSION:

In this paper, we explore the relationship between early marriage and education for girls in parts of Eastern and Southern Africa, addressing three key research questions:

1. How does a girl's marital status affect her participation in school?

2. How does the effect of marriage on school participation vary by relative household wealth, age, urban or rural residence (locality), and educational attainment?

3. How does the effect of childbirth on school participation compare to the effect of marriage?

For *Research Question 1*, we conclude that marital status has a strong effect on attendance. The *odds of a married girl attending school are more than 20 times less than the odds of her unmarried peer*, making it a near-certainty that a girl married at the age of 14-17 in Southern and Eastern Africa will not stay in school, even if she was previously enrolled. Although married girls make up a relatively small portion of the population in the region, their marital status trumps every other characteristic in their background that has been shown to determine school participation for the population at large. However, the data also show, as did literature from the previous decade (Lloyd & Mensch, 2006) that background characteristics such as age, wealth status, educational attainment, and to a lesser extent, locality, are also strong predictors of early marriage. Poor and less educated girls are more likely to enter early marriage, and populations with higher incidence of early marriage are more likely to see teenage girls out of school. There is indication that poorer girls are also more likely to be out of school across the board – and these wealth effects vary by country, as shown in the Appendix.

The linkage between early marriage and education, even if it is causal, is more complex than it may seem. Early marriage is part of a system of social norms and behaviors accepted and expected of girls. Therefore, while efforts to eradicate child marriage are certain to reduce the likelihood of school dropout, one must address the entire social fabric surrounding teenage girls, including raising the value of continued education.

For *Research Question 2* (*How does the effect of marriage on school participation vary by relative household wealth, age, urban or rural residence (locality*), and educational attainment?), our findings are less clear. It appears that the differences in attendance associated with marriage are less pronounced for older girls (in the 14–17 age range). Younger girls, however, are more likely to attend school in general, and therefore marriage exerts a stronger pull on their attendance, with the probability of attending at 4.4% at age 14. We also observe that married girls from poor households are more likely to stop attending school, while the difference in the likelihood of school attendance between married and unmarried wealthy girls is somewhat smaller.

For *Research Question 3*, in the context of Malawi, we find that, while both marriage and childbirth impact whether a girl drops out of school the following year, marriage is a far more influential predictor than childbirth. That is, it appears that a shift in marital status generally coincides with the end of a young woman's school career. This suggests that, for most girls in the current school and community contexts in Malawi, marriage and schooling are typically incompatible in a way that leaves little space for an added effect of childrearing. However, pregnancy and childbirth are equally incompatible with school attendance in the year when childbirth takes place – a possible result of a policy preventing pregnant girls from attending school, while allowing girls to re-enroll one year after childbirth.

Limitations

Several limitations of our study must be taken into account: issues of scope, causality, and reliability of background measures.

Scope: In the regional analysis, we are limited to a set of countries in Southern and Eastern Africa with available DHS data, which excludes several countries in the region from the analysis. Based on available statistics of marriage and school attendance (see Appendix), these countries as a group are representative of the region. In addition, the magnitude of the effects we are finding with early marriage indicates a definitive negative relationship that is unlikely to be sensitive to small differences in context. However, for countries where the policy environment, culture, or schooling opportunities differ dramatically from those in the sample, the resulting differences in attendance attributed to early marriage may not be the same.

In the Malawi analysis, we may not have enough information from the time span captured by the survey to fully consider the ramifications of childbirth on education. In Malawi, girls who become pregnant must withdraw from school and are permitted to re-enroll in school one year after childbirth through the 1993 Readmission Policy. This limits the population we were able to consider, since pregnant girls are less likely to have attended school in academic year 1. However, we are able to capture the vast difference in the odds ratios of attendance between girls who experienced childbirth in the previous year, and those who had the first child during the school year in question.

Causality: In our first research question, we are looking broadly at whether girls who marry young are less likely to attend than their unmarried peers. This says nothing about what came first—marriage or schooling decisions. A young woman may have dropped out of school for a reason not related to marriage or the factors we account for (i.e., wealth, locality, age) or made a decision to marry because of the inability – unwillingness – to continue her education. Again, because of the striking magnitude of the effects we find, and the fact that we are finding interaction effects that moderate the effects of marriage on attendance, we have reason to believe that the direction of the causal relationship *from* early marriage *to* school nonparticipation holds for most girls. Further, if there was an unobserved factor that affected both marriage and dropout, for it to substantially bias our results it would need to be *un*correlated with the factors that we do account for, including wealth, locality, age, and educational attainment.

It is more likely, in fact, that our analysis *under*estimates the negative effect of marriage, if withdrawal from school is driven by *anticipated* marriage for girls who are coded as unmarried in our sample. An important event like a marriage is often planned well in advance and that school attendance patterns may be altered to accommodate marriage in a way that cannot be measured, so it is possible that, anticipating a marriage that will take place part-way through the reference school year, a household elects to withdraw the child from school prior to the beginning of the school year. In this hypothetical case, the withdrawal from school precedes the marriage, but causality still flows from the marriage to the withdrawal.

Reliability of measures: Our insight into school participation is limited because our attendance variable measures attendance at any time during the year, and therefore does not distinguish between girls who attend regularly and those who leave school early. Therefore, if anything, it is likely that we are over-estimating the educational participation of some girls. Our analysis is also limited by what we are not measuring. For example, we are not able to include religious or cultural characteristics, which may be associated with traditional beliefs that devalue educational opportunities for girls and see financial value or safety in early marriage. We also are not able to include socioeconomic measures beyond wealth, such as the education of the parents. Finally, there is no measure of economic circumstances or the girls' health status prior to (or after) marriage, which may have motivated the marriage as well as current and past educational experience.

Despite these limitations, we believe this study provides a useful assessment of the damage to educational access for girls who marry in their teen years.

RECOMMENDATIONS

In attempting to gauge the policy implications of this study, it is essential to consider the relationship between early marriage and girls' school participation with attention to the scope of the issue. Taking into account marriage rates across Eastern and Southern Africa, 15 of every 100 girls ages 14-17 are married and, of those, approximately 14 are out of school. This represents a substantial population of girls who experience a unique set of circumstances related to the responsibilities and social expectations for wives (and daughters-in-laws) that severely limit their educational opportunities and whose situations, at present, seem incompatible with traditional schooling.

Teenage girls' marriage demands a unique set of policy options that consider the educational needs of this group of girls, rather than isolated policies that target issues of girls' education generally (Walker, 2013). In short, there needs to be greater attention paid directly to the role of education in mitigating early marriage and improving the educational opportunities for girls who are anticipating becoming married in the near future as well as those who are already married. Indeed, married girls constitute a population with specific educational needs that are rarely met by the mainstream education systems (some non-formal or distance education programs seek to help).

What the Malawi analysis may suggest more positively, however, is that policy is gradually improving the educational opportunities for girls who give birth. In 1993 Malawi instituted a policy that permits girls who are pregnant to return to school after they give birth, a right that they had previously been denied. It has taken years for the policy to gain traction against customary practices that saw motherhood and education as incompatible, and girls who become pregnant still face many obstacles to continuing their education. However, some progress has been made and, notably, our analysis suggests that girls who give birth but are not married are less likely to leave school than girls who marry.

These findings have important policy implications, and a key next step would be a rigorous review of policies impacting girls' marriage, pregnancy, and education. We have noted that the countries included in the analysis have signed and ratified the African Charter, but do not explore education policies or other sectoral policies that may directly or indirectly have an effect, such as the Readmission Policy in Malawi (Samati, 2013). Future research may consider:

- Investigations of policies and programs that have brought success in reducing child marriage. Given the relatively low incidence of child marriage in Rwanda and relatively high attendance rates, this would be a fruitful place to start.
- Factors that affect the likelihood of early marriage and subsequent drop in attendance, above and beyond those addressed in this paper. For example, Jensen and Thornton (2003) note that in female- or grandparent-headed households in violent or high crime areas, household heads may be more likely to marry girls young with their safety in mind.
- Research might focus on the small population of girls who are married and in school to learn what factors contribute to their continued education.
- Research could also focus on girls who give birth and remain in/return to school, in cases where they are married and not married.
- Given that marriage appears incompatible with current education options for girls in Eastern and Southern Africa, support programs – as well as enforcement of policies already in place– are needed to lower the incidence of early marriage and provide educational opportunities for girls already married, pregnant, or with young children. The progress made by some countries in East Africa in recent years in reducing child marriage shows that this is not only possible, but also achievable within a relatively short time period.

REFERENCES

African Union. (2011). *African charter on the rights and welfare of the child.* Addis Ababa, Ethiopia: African Union Commission. Retrieved from http://acerwc.org/the-african-charter-on-the-rights-and-welfare-of-the-child-acrwc/acrwc-en/

Archer, K. J. & Lemesha, S. (2006). *Goodness-of-fit test for a logistic regression model fitted using survey data.* Stata Journal, 6: 97-105.

Hahs-Vaughn, D. L. (2005). *A primer for using and understanding weights with national datasets.* The Journal of Experimental Education, 73(3), 221-248. Retrieved from http://education.ufl.edu/educational-research/files/2011/01/Hahs-Vaughn_2005_Using-weights-with-national-datasets.pdf

ICF International. (2012). *Demographic and Health Survey sampling and household listing manual.* Retrieved from http://www.measuredhs.com/pubs/pdf/DHSM4/DHS6_Sampling_Manual_Sept2012_DHSM4.pdf

ICRW. (2013). *I Know. I Want. I Dream. Girls' insights for building a better world.* International Center for Research on Women. Retrieved from http://www.icrw.org/publications/i-know-i-want-i-dream

Jaccard, J. (2001). *Interaction effects in logistic regression.* Sage University Papers Series on Quantitative Applications in the Social Sciences (07-135). Thousand Oaks, CA: Sage.

Jenson, R. & Thornton, R. (2009). *Early female marriage in the developing world.* Gender and Development, 11(2), 9-19.

Kish, L. (1995). *Survey sampling.* New York, NY: John Wiley & Sons.

Lloyd, C. B. & Mensch, B. S. (2006). *Marriage and childbirth as factors in school exit: An analysis of DHS data from sub-Saharan Africa (Population Council Working Paper No. 219).* New York: The Population Council.

Lloyd, C. B. & Mensch, B. S. (2008). *Marriage and childbirth as factors in dropping out from school: An analysis of DHS data from sub-Saharan Africa, Population Studies, 62*(1), 1-13.

Otoo-Oyortey, N. & Pobi, S. (2003). *Early marriage and poverty: Exploring links for policy and programme development.* London: Forum on Marriage and the Rights of Women and Girls.

Rutstein, S. O. & Johnson, K. (2004). *The DHS Wealth Index. DHS Comparative Reports No. 6.* Calverton, Maryland: ORC Macro. Retrieved from http://www.measuredhs.com/pubs/pdf/CR6/CR6.pdf

Samati, M. (2013). At the interface of policy and cultural change: Engaging communities in support of girls' education in Malawi. In *Improving learning opportunities and outcomes for girls in Africa (2013 Echidna Global Scholars Working Paper).* Washington, DC: Brookings Institution, Center for Universal Education.

Skinner, C., & Mason, B. (2012). Weighting in the regression analysis of survey data with a cross-national application. *The Canadian Journal of Statistics, 40*(4), 697-711.

UIS Data Centre. Accessed at http://www.uis.unesco.org/ on Feb 28, 2014.

UN DESA [United Nations Department of Economic and Social Affairs] Population Division. (2013). *World Population Prospects: The 2012 Revision (DVD Edition)*. New York: United Nations.

UNESCO. (2014). (Education for All Global Monitoring Report 2013-14). Paris: UNESCO.

UNFPA. (2012). *Marrying too young: End child marriage. New York: United Nations Population Fund.* Retrieved from https://www.unfpa.org/webdav/site/global/shared/documents/publications/2012/MarryingTooYoung.pdf

UNFPA. (n.d.). *Child Marriage Profiles.* Retrieved from http://devinfo.info/mdg5b/Profiles/

UNICEF. (2001). *Early marriage: Child Spouses*. Innocenti Digest No. 7. Italy: UNICEF Innocenti Research Centre.

UNICEF. (2005). *Early Marriage: A Harmful Traditional Practice.* Retrieved from http://www.unicef.org/publications/files/Early_Marriage_12.lo.pdf. New York: UNICEF.

Vogelstein. (2013). *Ending child marriage: How elevating the status of girls advances U.S. Foreign Policy Objectives.* New York: Council on Foreign Relations.

Walker, J-A. (2013). Why ending child marriage needs to be an education goal: The case for improved coordination between ending child marriage and girls' education movements in West Africa. In *Improving learning opportunities and outcomes for girls in Africa (2013 Echidna Global Scholars Working Paper).* Washington, DC: Brookings Institution, Center for Universal Education.

APPENDIX A:
Overview of information used in preparing datasets

Country	Dates of Survey Enumeration	School Year	School Year Start Date	n Women Age 15-49[26] (unadjusted ages)	n Girls Age 14-17 (adjusted ages)	Merge Error (% of female observations unmatched to household dataset)
Burundi	08/2010 - 01/2011	2009-2010	9/2009	9,287	1,941	0.24% (102 observations)
Kenya	11/2008 - 02/2009	2008	01/2008	8,255	1,376	0.50% (189 observations)
Madagascar	11/2008 - 7/2009	2009	09/2008	17,152	2,697	0.26% (223 observations)
Malawi	06/2010 - 11/2010	2010	01/2010	23,020	3,884	0%
Mozambique	06/2011 - 11/2011	2011	01/2011	13,491	2,241	0.41% (254 observations)
Rwanda	09/2010 - 03/2011	2010	01/2010	13,413	2,326	0.46% (258 observations)
Tanzania[27]	12/2009 - 05/2010	2010	01/2010	9,630	1,387	0.95% (465 observations)
Uganda	06/2011 - 12/2011	2011	02/2011	8,449	1,425	0.51% (225 observations)
Zimbabwe	09/2010 - 03/2011	2010	1/2010	8,836	1,519	0.81% (335 observations)
Pooled		**2008-2011**		**111,529**	**18,796**	

[26] The population listed is the sample size after the household roster and female datasets were merged and does not include unmatched observations, which are noted in the right-most column of Table 1.
[27] Survey enumeration in Tanzania began one month before the start of the 2011 school year. Of the subpopulation aged 14-17, 140 observations are from this time period. We did not exclude these observations as the differences in the percentage attending for the two periods was just over 1%.

EPDC's Age Adjustment

When preparing the household roster dataset and female datasets for use, EPDC conducted an age adjustment. The standard age variable used in the DHS datasets reflects women's ages at the date they were interviewed for the survey. However, in our analysis we are interested in women's ages with reference to a specific school year rather than at the time they were interviewed, so we used women's birthdate information to calculate the age she would have been at the beginning of the school year referenced in the survey questionnaire and detailed in the table above, which also provides information on the month that that school year officially began (retrieved from the UNESCO Institute for Statistics (UIS) Data Centre), the range of months over which survey data were collected, and dates of the school year.

Note that due to the large amount of time elapsed between the dates that interviews were conducted and the date that the earliest school year began, a typical young woman would have had between zero and two birthdays in the interim and, by extension, would be 0 to 2 years younger when the school year began in our dataset. Because we take the opening month of the earliest school year as our reference period, our datasets are representative of women who were as young as 14[28]. The table above provides further information on sample sizes for each dataset as well as for the age group (14-17) of interest to this study.

Denormalizing Survey Weights

In addition to performing an age adjustment, we modified the weighting in country datasets used in the multi-country analysis. DHS datasets employ relative (or normalized) weights that are specific to each sex (ICF International, 2012). In DHS the relative weighting ensures that at the national level the number of weighted observations equals the number of un-weighted observations, facilitating cleaner presentation of estimates in the DHS Reports (ICF International, 2012); however, relative weights are not valid for analyzing pooled datasets. In order to create a pooled dataset that would facilitate analysis across Eastern and Southern Africa, we transformed the relative weights to raw weights by multiplying the normalized weight by the ratio of the total population of women aged 15-49 taken from the World Population Prospects[29] (UN DESA Population Division, 2013) to the sample population as follows (Hahs-Vaughn, 2005):

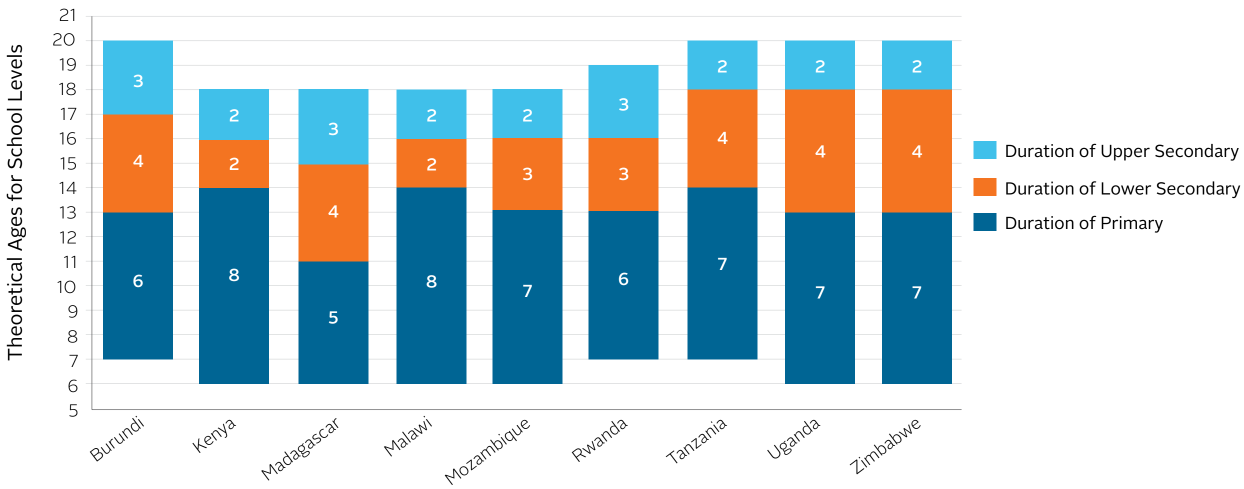
Raw weights = normalized weight*(N/n)

---

[28] 65 young women had 2 birthdays in the interim between the school year and survey enumeration and had adjusted ages of 13. Because this makes a small subpopulation across our 9 countries, our analysis excludes these young women and begins with 14 year olds.

[29] World Population Prospects provides population estimates for July of each year. We use the estimate for the July closest to the school start date. For Mozambique and Uganda, we would ideally have used July 2011 estimates; however, we did not have access to these at the time of writing and so July 2010 estimates have been used instead.

APPENDIX B:
Overview of School Systems for the Nine Countries in the Study



APPENDIX C: Variable Coding and Frequency Tables

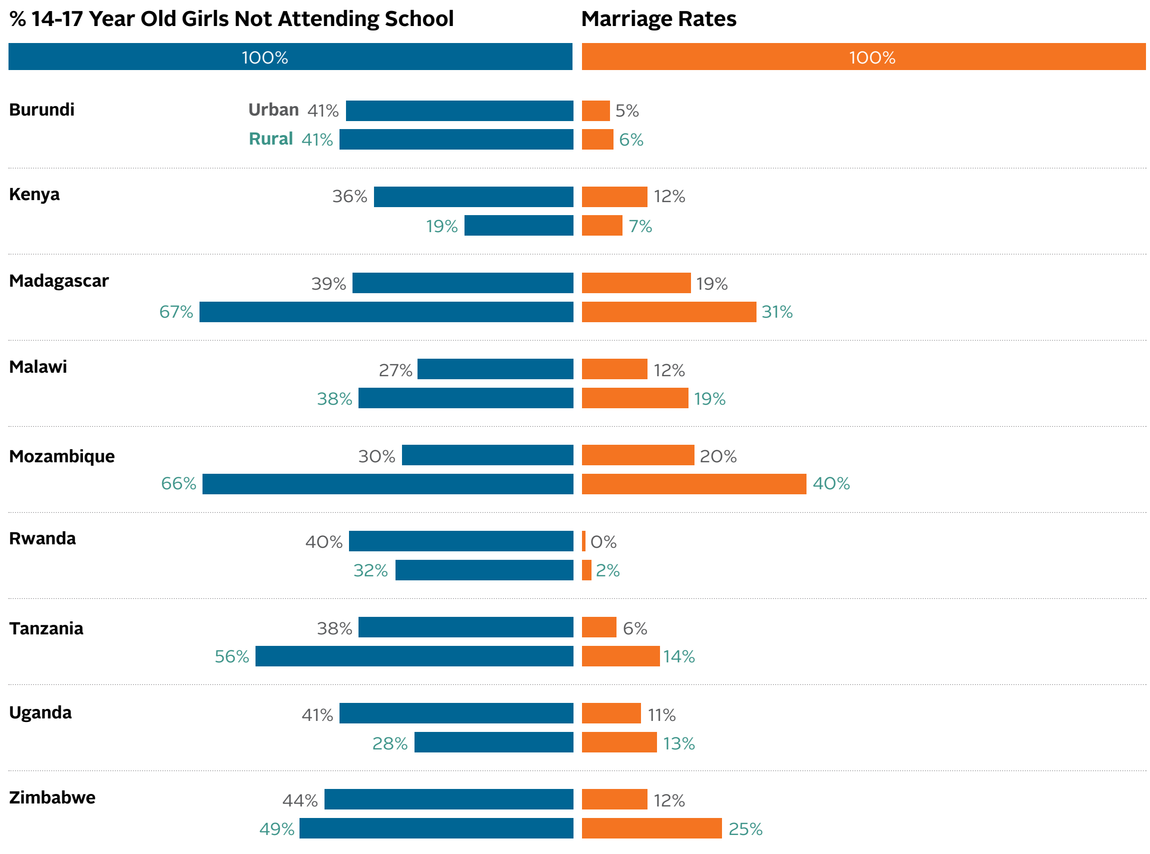
Variables used in the multi-country analysis

Variable Name	Categories	Coding	Frequency	Percent	Notes
Marriage	Married	0	2,996	15.87	Girls are considered married if they said they were married or cohabitating at the time of the interview.
	Unmarried	1	15,885	84.13	
Wealth Quintile	Poorest	-2	3,291	17.43	Wealth quintiles are country-specific and represent relative wealth within each country.
	Poorer	-1	3,293	17.44	
	Middle	0	3,460	18.33	
	Richer	1	3,786	20.05	
	Richest	2	5,051	26.75	
Age	14	-1.60	3,720	19.7	The average age for a girl in the multi-country analysis is 15.6 years.
	15	-0.60	5,414	28.67	
	16	0.40	4,808	25.46	
	17	1.40	4,939	26.16	
Locality	Urban	0	4,786	25.35	The region is predominantly rural: 77.3% of girls in the multi-country analysis live in rural areas.
	Rural	1	14,095	74.65	
Attainment	0	-6.23	1,440	7.63	The mean number of years of school completed for girls in the multi-country analysis is 6.2.
	1	-5.23	349	1.85	
	2	-4.23	717	3.8	
	3	-3.23	1,119	5.93	
	4	-2.23	1,883	9.97	
	5	-1.23	2,377	12.59	
	6	-0.23	2,577	13.65	
	7	0.77	2,691	14.25	
	8	1.77	2,205	11.68	
	9	2.77	1,516	8.03	
	10	3.77	1,105	5.85	
	11	4.77	636	3.37	
	12	5.77	212	1.12	
	13	6.77	36	0.19	
	14	7.77	12	0.06	
	15	8.77	5	0.03	
Year	2008	0	1,222	6.47	
	2009	1	2,981	15.79	
	2010	2	8,848	46.86	
	2011	3	5,830	30.88	
Country	Burundi	BU6	1,932	10.23	
	Kenya	KE5	1,375	7.28	
	Madagascar	MD5	2,688	14.24	
	Malawi	MW5	3,959	20.97	
	Mozambique	MZ6	2,239	11.86	
	Rwanda	RW6	2,326	12.32	
	Tanzania	TZ5	1,390	7.36	
	Uganda	UG6	1,456	7.71	
	Zimbabwe	ZW6	1,516	8.03	

APPENDIX C: (continued)
Variables used in Malawi Analysis

Variable Name	Categories	Coding	Frequency	Percent
School Exit	Attended in Year 2	0	2,760	87.42
	Did not attend in Year 2	1	397	12.58
Marriage in Year 1	Did not become married in Year 1	0	3,076	97.43
	Became married in Year 1	1	81	2.57
Marriage in Year 2	Did not become married in Year 2	0	3,032	96.04
	Became married in Year 2	1	125	3.96
First Child Birth in Year 1	Did not experience first child birth in Year 1	0	3,133	99.24
	Gave birth for the first time in Year 1	1	24	0.76
First Child Birth in Year 2	Did not experience first child birth in Year 2	0	3,078	97.5
	Gave birth for the first time in Year 2	1	79	3
Age	13	-1.7	605	19.16
	14	-0.7	1,043	33.04
	15	0.3	719	22.77
	16	1.3	517	16.38
	17	2.3	273	8.65
Wealth Quintile	Poorest	-2	507	16.06
	Poorer	-1	507	16.06
	Middle	0	609	19.29
	Richer	1	742	24
	Richest	2	792	25.09
Locality	Urban	0	462	14.63
	Rural	1	2,695	85
Attainment	0	-7.05	4	0.13
	1	-6.05	9	0.29
	2	-5.05	30	0.95
	3	-4.05	109	3.45
	4	-3.051	234	7.41
	5	-2.051	402	12.73
	6	-1.051	489	15.49
	7	-0.051	486	15.39
	8	0.95	625	19.8
	9	1.95	260	8.24
	10	2.95	325	10.29
	11	3.95	117	3.71
	12	4.95	67	2.12

APPENDIX D: Rates of Non-Attendance and Marriage for Young Women Ages 14-17 By Country and Locality



APPENDIX E: Results of Multi-Country Regression Models without Interaction Terms

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Logistic model results presented as: 1) Odds Ratio 2) 95% CI 3) p	Logistic Model with Marriage as the only predictor	Logistic Model with Marriage & Wealth only	Logistic Model with Marriage, Wealth, & Age only	Logistic Model with Marriage, Wealth, Age, & Locality only	Logistic Model with Marriage, Wealth, Age, & Attainment only	Logistic Model with all main predicators & controls for Country	Logistic Model with all lower-order predictors & controls for Year & Country	OLS Model with all lower-order predictors & controls for Year & Country
Marriage	32.4 [26.3 - 39.9] p < .001	30.4 [24.7 - 37.5] p < .001	23.9 [19.4 - 29.6] p < .001	23.9 [19.3 - 29.6] p < .001	22.1 [17.4 - 27.9] p < .001	23.5 [18.1 - 30.4] p < .001	23.6 [18.2 - 30.6] p < .001	0.4 [0.4 - 0.4] p < .001
Wealth		1.2 [1.1 - 1.2] p < .001	1.2 [1.2 - 1.3] p < .001	1.3 [1.2 - 1.3] p < .001	1 [1 - 1.1] p = 0.82	0.9 [0.9 - 1] p = 0.07	0.9 [0.9 - 1] p = 0.07	0 [0 - 0] p = 0.19
Age			0.7 [0.6 - 0.7] p < .001	0.7 [0.6 - 0.7] p < .001	0.5 [0.5 - 0.5] p < .001	0.5 [0.5 - 0.5] p < .001	0.5 [0.5 - 0.5] p < .001	(-0.1) [-0.1 - -0.1] p < .001
Locality				1.3 [1.1 - 1.6] p < .001	1.8 [1.5 - 2.2] p < .001	1.5 [1.3 - 1.8] p < .001	1.5 [1.3 - 1.8] p < .001	0.1 [0 - 0.1] p < .001
Attainment					1.6 [1.5 - 1.6] p < .001	1.7 [1.7 - 1.8] p < .001	1.7 [1.7 - 1.8] p < .001	0.1 [0 - 0.1] p < .001
√ Attainment					n/a	n/a	n/a	0 [0 - 0.1] p = 0.01
Year							0.8 [0.6 - 1] p = 0.09	0 [-0.1 - 0] p = 0.04
Burundi						1.4 [1.1 - 1.6] p < .001	1.4 [1.1 - 1.6] p < .001	0 [0 - 0.1] p < .001
Kenya						1 [0.7 - 1.3] p = 0.84	0.7 [0.5 - 1.2] p = 0.18	0 [-0.1 - 0] p = 0.32
Madagascar						0.6 [0.5 - 0.7] p < .001	0.5 [0.3 - 0.7] p < .001	(-0.1) [-0.2 - -0.1] p < .001
Mozambique						0.8 [0.6 - 1] p = 0.06	1 [0.7 - 1.4] p = 0.92	0 [0 - 0] p = 0.84
Rwanda						1.4 [1.2 - 1.6] p < .001	1.5 [1.2 - 1.8] p < .001	0.1 [0 - 0.1] p < .001
Tanzania						0.3 [0.2 - 0.4] p < .001	0.3 [0.2 - 0.4] p < .001	(-0.2) [-0.2 - -0.1] p < .001
Uganda						1.2 [1 - 1.5] p = 0.04	1.5 [1.1 - 2.1] p = 0.01	0.1 [0 - 0.1] p < .001
Zimbabwe						0.1 [0.1 - 0.1] p < .001	0.1 [0.1 - 0.2] p < .001	(-0.3) [-0.3 - -0.2] p < .001
Constant	0.1 [0.1 - 0.1] p < .001	0.1 [0.1 - 0.1] p < .001	0.1 [0.1 - 0.1] p < .001	0.1 [0.1 - 0.1] p < .001	0.1 [0 - 0.1] p < .001	0.1 [0.1 - 0.1] p < .001	0.2 [0.1 - 0.3] p < .001	0.3 [0.3 - 0.4] p < .001
Model Statistics	F (1, 4422) = 1075.01 Prob > F = 0.00 F-adjusted test stat = 1640.75 p < .001	F (2, 4421) = 548.20 Prob > F = 0.00 F-adjusted test stat = 3233.55 p < .001	F (3, 4420) = 422.16 Prob > F = 0.00 F-adjusted test stat = 3860.59 p < .001	F (4, 4419) = 322.79 Prob > F = 0.00 F-adjusted test stat = 4103.17 p < .001	F (5, 4418) = 297.17 Prob > F = 0.00 F-adjusted test stat = 1699.44 p < .001	F (13, 4410) = 113.36 Prob > F = 0.00 F-adjusted test stat = 1518.77 p < .001	F (14, 4409) = 106.38 Prob > F = 0.00 F-adjusted test stat = 1439.71 p < .001	F (15, 4408) = 414.40 Prob > F = 0.00 R-squared=0.4

APPENDIX F: Results of Regression Models for Individual Countries

Model	Burundi	Kenya	Madagascar	Malawi	Mozambique	Rwanda*	Tanzania	Uganda	Zimbabwe
Marriage	8.3 [2.2 - 32] p < .001	42.4 [17.6 - 102.4] p < .001	8.4 [5.2 - 13.7] p < .001	28.2 [18.3 - 43.7] p < .001	14.6 [9.8 - 21.6] p < .001	-	50.8 [6.7 - 383.2] p < .001	95.5 [33.2 - 275.2] p < .001	12.2 [6.8 - 22.1] p < .001
Wealth	1 [0.9 - 1.2] p = 0.53	0.7 [0.5 - 0.9] p = 0.01	0.9 [0.8 - 1] p = 0.09	1 [1 - 1.1] p = 0.34	1.2 [1 - 1.4] p = 0.02	-	1 [0.9 - 1.2] p = 0.97	0.9 [0.8 - 1] p = 0.15	1 [0.9 - 1.2] p = 0.85
Age	0.4 [0.3 - 0.4] p < .001	0.4 [0.3 - 0.5] p < .001	0.5 [0.5 - 0.6] p < .001	0.5 [0.4 - 0.5] p < .001	0.6 [0.5 - 0.7] p < .001	-	0.6 [0.5 - 0.7] p < .001	0.5 [0.4 - 0.6] p < .001	0.4 [0.3 - 0.4] p =0.17
Locality	4.1 [2.5 - 6.6] p < .001	2.2 [1 - 4.9] p = 0.06	1 [0.6 - 1.6] p = 0.96	1.7 [1.1 - 2.6] p = 0.01	0.7 [0.5 - 1] p = 0.07	-	0.9 [0.6 - 1.4] p = 0.75	4.3 [2.7 - 6.9] p < .001	1.4 [0.9 - 2.4] p < .001
Attainment	2.6 [2.4 - 2.9] p < .001	1.7 [1.5 - 1.9] p < .001	2.3 [2 - 2.5] p < .001	1.7 [1.6 - 1.8] p < .001	1.6 [1.5 - 1.7] p < .001	-	1.7 [1.5 - 1.8] p < .001	1.6 [1.4 - 1.8] p < .001	1.9 [1.7 - 2.1] p < .001
Constant	0.4 [0.1 - 1.3] p = 0.12	0 [0 - 0.1] p < .001	0.3 [0.2 - 0.5] p < .001	0.1 [0 - 0.1] p < .001	0.2 [0.1 - 0.3] p < .001	-	0 [0 - 0.2] p < .001	0 [0 - 0] p < .001	0 [0 - 0] p < .001
Model Statistics	n = 1932	n = 1375	n = 2688	n = 3959	n = 2239	-	n = 1390	n = 1456	n = 1516
	F = 76.4 (p < 0.001)	F = 28.1 (p < 0.001)	F = 69.1 (p < 0.001)	F = 79.9 (p < .001)	F = 87.6 (p < 0.001)	-	F = 31.1 (p < 0.001)	F = 28.5 (p < 0.001)	F = 48.1 (p < 0.001)

Note: Rwanda is omitted from the analysis because there were no married girls attending, and the 32 observations for married girls perfectly predicted non-attendance.

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