Has Child Marriage Declined in sub-Saharan Africa? An Analysis of Trends in 31 Countries

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CHILD MARRIAGE, defined by the United Nations as marriage before the age of 18, disproportionately affects girls and hinders progress toward development and public health goals. The magnitude of the threat child marriage poses to global development is highlighted by the fact that its elimination is one of the specific targets for achieving goal number five of the UN's Sustainable Development Goals: gender equality and the empowerment of all women and girls.

Women who marry as children have fewer years of schooling than those who marry as adults, potentially leading to lower labor force participation and poorer long-term economic opportunities for themselves and their families (Jejeebhoy 1995; Field and Ambrus 2008; Parsons et al. 2015). Child marriage is also harmful to girls' health. Married girls begin childbearing earlier, give birth at shorter intervals, and report having more unwanted pregnancies than their peers who marry as adults (Raj et al. 2009). All of these outcomes are associated with obstetric complications, which are the leading cause of death among young women in low- and middle-income countries (Patton et al. 2009). Young married women also have higher rates of HIV infection than their unmarried, sexually active peers (Glynn et al. 2001), likely as a result both of marrying older men who are already infected and of having limited agency to negotiate condom use (Bracher, Santow, and Watkins 2003; Kelly et al. 2003; Clark 2004).

Very few studies differentiate the effects of marriage among very young girls from those among older adolescents. However, marriage may have more severe consequences for girls at the younger end of the age spectrum, say below the age of 15, relative to girls between 15 and 17 years of age. The educational opportunities for very young girls and their ability to develop social networks outside of their families may be curtailed to a greater degree simply as a result of their age. Raj (2010) found that girls in India

who married before age 14 were less likely to have any formal schooling than those married between ages 16–17 and that the odds of experiencing spousal violence increased as age at marriage declined. In another study from South Asia, Godha, Hotchkiss, and Gage (2013) reported that women married before age 14 were less likely to use contraception prior to their first pregnancy and had more unintended pregnancies relative to girls married between 15 and 17 years of age, suggesting that control over sexual activity and reproductive decisions is even further diminished at younger ages. Moreover, the relative physiological immaturity of younger girls may put them at greater risk of acquiring sexually transmitted infections and experiencing obstetric complications (Moss et al. 1991; Nove et al. 2014).

Age at marriage is rising throughout sub-Saharan Africa. The singulate mean age at marriage is now greater than 18 in the vast majority of countries in the region and in all of the countries included in our analysis (United Nations, Department of Economic and Social Affairs, Population Division 2015). Even so, sub-Saharan Africa has the highest rates of child marriage in the world, and previous studies have estimated that more than half of girls marry before age 18 in many countries in the region (Singh and Samara 1996; Mensch, Singh, and Casterline 2006). Measuring trends in the prevalence of child marriage over time is important for understanding where the practice is most common and for evaluating the effectiveness of efforts to eliminate it. However, measuring age at marriage in sub-Saharan Africa is difficult. Unlike Western marriages, which are often unambiguously dated by a ceremony, the signing of legal documents, and civil registration, marriage in sub-Saharan Africa is often described as a process consisting of multiple stages including legitimized sexual relations, cohabitation, and ceremonies. The process can be lengthy and the various stages occur in different sequences across ethnic and social groups (van de Walle and Meekers 1994; Locoh 1994; Arnaldo 2004). If several events are required to solidify a union, it may be unclear when the union was formalized.

Measures of age at first marriage in Demographic and Health Surveys

The Demographic and Health Surveys (DHS) were developed to measure fertility rates in a comparable manner across developing countries. The surveys estimate the total number of women at risk of childbearing and include broad questions intended to identify stable unions that may result in children. All female respondents are asked to report their current marital status and the month and year they were first married or began cohabiting with a partner. Those who report that they are married or living with a partner are considered in union. These questions result in imperfect data on age at marriage. Where union formation consists of multiple stages, it is unclear

which point in the process corresponds to the reported month and year of marriage.

Despite these limitations, the DHS are the most widely available nationally representative source of information on age at marriage in sub-Saharan Africa and throughout the developing world. The DHS program's focus on international comparability has facilitated multiple studies that compare change in age at marriage across developing regions as well as numerous studies that examine trends specific to sub-Saharan Africa (Singh and Samara 1996; Harwood-Lejeune 2001; Westoff 2003; Jensen and Thornton 2003; Garenne 2004; Mensch, Singh, and Casterline 2006; Mensch, Grant, and Blanc 2006; Shapiro and Gebreselassie 2013). Most of these studies have used a single DHS wave to estimate the proportion of women interviewed at different ages who reported being married before a specified age. For example, Mensch, Singh, and Casterline (2006) used the most recent survey wave in 27 sub-Saharan African countries to calculate the proportion of women interviewed between ages 20–24 and 40–44 who reported being married before the age of 18. A few studies have presented estimates of trends in age at marriage across birth cohorts rather than age groups. Jensen and Thornton (2003) reported trends in age at marriage over birth cohorts from 1950 to 1970 using a single DHS wave. Westoff (2003) and Garenne (2004) pooled data from World Fertility Surveys and DHS waves within countries to estimate trends over birth cohorts between 1925 and 1979. Only a handful of studies have focused on trends in child marriage (Singh and Samara 1996; Jensen and Thornton 2003; Mensch, Singh, and Casterline 2006; Mensch, Grant, and Blanc 2006).

Measuring change in age at marriage by comparing reports from women of different ages leads to potential measurement error. Older DHS respondents report less complete information on age at marriage, meaning that their data are more frequently imputed than data for younger women (Gage 1995). Older women are also known to report that events occurred closer to the time of the survey than they actually did, a bias referred to as forward displacement and well recognized in studies using DHS data (Blanc and Rutenberg 1990; Gage 1995; Mensch, Grant, and Blanc 2006). If forward displacement of age at marriage affects DHS data, we would expect measures of change over time based on the comparison of women of different ages to systematically underestimate the magnitude of change. For example, if women aged 40–44 years tend to report that their first union took place closer to the date of the interview than it actually did, this would result in fewer women in this age group being classified as married before the age of 18 than actually were. This would lead to erroneously small estimates of change over time when compared with reports from women aged 20–24. Moreover, child marriage is strongly associated with poverty and maternal mortality at the national level (Raj and Boehmer 2013). Concerns regarding the validity of age-based comparisons for estimating change over time

deepen if women who married as girls are more likely to die from maternal or poverty-related causes earlier than their peers who married as adults. This differential probability of survival would also lead to underestimates of change in the prevalence of child marriage over time.

Recent work by Neal and Hosegood (2015) provides further reason to avoid using women of different ages to estimate trends. The authors documented significant inconsistencies in the reporting of reproductive events among women born in the same cohort but interviewed at different ages. They estimated the prevalence of marriage before age 15 among a sample of women born in the same cohort who were interviewed between ages 15 and 19 and again, five years later, when they were between ages 20 and 24. The estimated prevalence of marriage before the age of 15 differed markedly between these age groups.

In the analysis that follows, we measured trends in the prevalence of marriage before age 15 and before age 18 in 31 countries over a 25-year period. We pooled data from all available DHS waves within each country to measure change over the same time period across all countries. We attempted to avoid biases resulting from the forward displacement of events and selective survival by using a sample of women who were interviewed at the same age. We then compared our results with estimates of change obtained by comparing women who were interviewed at different ages using a single DHS wave.

Data and statistical analyses

Primary analyses

For our primary analyses we used DHS data from 31 sub-Saharan African countries that had conducted at least two standard survey waves. These analyses rely on retrospective reports of age at first marriage provided by female respondents. We began by pooling data from all available survey waves within each country and then limited our sample to women who were born between 1965 and 1994 and were between ages 20 and 24 at the time they were interviewed. Sample sizes by country are listed in Table 1. Including only women interviewed between ages 20 and 24 avoids censoring of women below age 18 and allows us to minimize potential biases resulting from forward displacement of age at marriage and selective survival.

We estimated the proportion of women who reported being married before 15 and 18 years of age over consecutive five-year birth cohorts using logistic regression. We regressed dummy variables for each birth cohort on a binary indicator of marriage before either age 15 or 18 and then used the coefficients associated with each dummy variable to predict the probability of marriage before that age for each birth cohort. We graphed these estimates to illustrate trends over a 25-year period from 1965–69 to 1990–94.

TABLE 1 Countries and DHS waves used in the measurement of trends in child marriage

Country	DHS waves used	Total sample size from all survey waves
West Africa		
Benin	1996, 2001, 2006, 2011	6,844
Burkina Faso	1992, 1998, 2003, 2010	6,795
Cote d'Ivoire	1994, 1998, 2011	4,137
Ghana	1988, 1993, 1998, 2003, 2008, 2014	5,750
Guinea	1999, 2005, 2012	3,829
Liberia	2006, 2013	2,970
Mali	1995, 2001, 2006, 2012	8,544
Niger	1992, 1998, 2006, 2012	6,250
Nigeria	1990, 2003, 2008, 2013	15,212
Senegal	1986, 1992, 1997, 2005, 2010-14	12,600
Sierra Leone	2008, 2013	3,651
Togo	1988, 1998, 2013	2,894
East Africa		
Burundi	1987, 2010	1,775
Comoros	1996, 2012	982
Ethiopia	2000, 2005, 2011	7,388
Kenya	1988, 1993, 1998, 2003, 2008, 2014	13,211
Madagascar	1992, 1997, 2003, 2008	6,352
Malawi	1992, 2000, 2004, 2010	10,144
Mozambique	1997, 2003, 2011	5,817
Rwanda	1992, 2000, 2005, 2010, 2014	10,148
Tanzania	1991, 1996, 1999, 2004, 2009	8,024
Uganda	1988, 1995, 2000, 2006, 2011	6,586
Zambia	1992, 1996, 2001, 2007, 2013	9,351
Zimbabwe	1988, 1994, 1999, 2005, 2010	6,490
Central and Southern Africa		
Cameroon	1991, 1998, 2004, 2011	6,190
Chad	1996, 2004, 2014	5,340
Congo (Brazzaville)	2005, 2011	2,520
Dem. Republic of Congo	2007, 2013	5,908
Gabon	2000, 2012	2,545
Lesotho	2004, 2009, 2014	4,289
Namibia	1992, 2000, 2006, 2013	5,551
Total		198,087

NOTE: Sample sizes include women born between 1965 and 1994 and aged 20–24 years at the time of interview.

We obtained estimates for each birth cohort in countries that conducted surveys at approximately five-year intervals between the late 1980s and the 2010s. In countries that had longer intervals between survey waves, we were only able to obtain estimates for some of the birth cohorts. Notably, birth cohorts do not correspond exactly to DHS waves; in many countries women born within the same cohort were interviewed in different survey

waves. Some of the five-year cohorts do not include women born in every year. To ensure that our estimates are reasonably representative of the entire five-year cohort, we report results only for cohorts in which at least three birth years were represented by a minimum of 100 women.

To quantify the magnitude of change over a period of 15–20 years, we also calculated prevalence differences by subtracting the proportion of women born between 1970 and 1974 who reported being married before ages 15 and 18 from the proportion of women born between 1985 and 1989 or 1990 and 1994, depending on data availability. In countries for which were able to estimate the proportion in both 1985–89 and 1990–94, we used the latter to measure change over the longer time period.

Sensitivity analyses

We conducted four types of sensitivity analyses to test the robustness of our measurement approach. First, as mentioned above, some of the five-year cohorts are represented by three or four individual birth years. To examine whether our estimates are sensitive to the fact that some birth years are not represented, we also measured trends over three-year cohorts in which all birth years were represented (analyses not shown). Second, we assessed the sensitivity of our results to the choice of age range at the time of interview by measuring trends using retrospective reports from women between 25 and 29 years of age.

Third, we compared our estimates of change in the prevalence of marriage before age 18 based on the analysis of pooled DHS data with estimates from the more common approach, which measures change by comparing women of different ages interviewed in a single DHS wave. For the latter analysis, we compared the proportion of women who reported being married before age 18 among those interviewed between ages 20–24 and between ages 40–44. This comparison was limited to a sample of seven countries in which we were able to estimate the prevalence of child marriage among women born between 1970 and 1974 and between 1990 and 1994 and that had conducted a DHS between 2013 and 2015 to ensure estimation over a similar time span. Most of the women aged 40–44 and interviewed in 2014 would have been born between 1970 and 1974; those aged 20–24 would have been born between 1990 and 1994.

Finally, to assess the robustness of our primary results, we compared measures of trends based on retrospective reports of age at first marriage with measures based on the current marital status of girls under the age of 18. For these analyses, we took advantage of the repeated cross-sectional nature of the DHS and national censuses. We obtained census data from 14 countries that conducted at least two national censuses between 1985 and 2015 from the Integrated Public Use Microdata Series (IPUMS) (Minnesota Population Center 2015). We calculated the proportion of

ever-married girls aged 15–17 interviewed in consecutive DHS surveys and recorded in each census using the same regression approach described above. However, we controlled for age in these analyses because estimates may be sensitive to changes in the distribution of age across survey and census waves. We also used national censuses to measure trends in the proportion of ever-married girls aged 12–14 included in consecutive censuses. We were unable to use DHS data for this younger age group because household rosters only record the marital status of persons aged 15 years and older.

Although estimates of trends based on current marital status avoid reliance on retrospective reports, they introduce a new set of limitations. First, there is a large problem with censoring, as some women interviewed between ages 15 and 17 may have gone on to marry before their 18th birthday. This means that the estimated levels of child marriage obtained from cross-sectional measures are expected to be lower than those estimated in our primary analysis. Second, census data are reported by the head of household, introducing an additional source of measurement error. The person responding to the census questions may provide less accurate information on the age and marital status of the girls within the household than the girls themselves would. Lastly, censuses are conducted less frequently than household surveys, which means that we have fewer data points and cannot characterize trends as well as we can with DHS data.

All of the estimates based on DHS data are weighted using de-normalized sampling weights following guidelines for the use of pooled data included in the DHS *Sampling and Household Listing Manual* (ICF International 2012). The de-normalization procedure requires estimates of the target population in each country at the time of each survey. We obtained estimates of the population of women aged 15–49 years in each survey year in each country from *World Population Prospects 2015* (United Nations 2015). Estimates based on census data are weighted using the country- and sample-specific person weights provided by IPUMS.
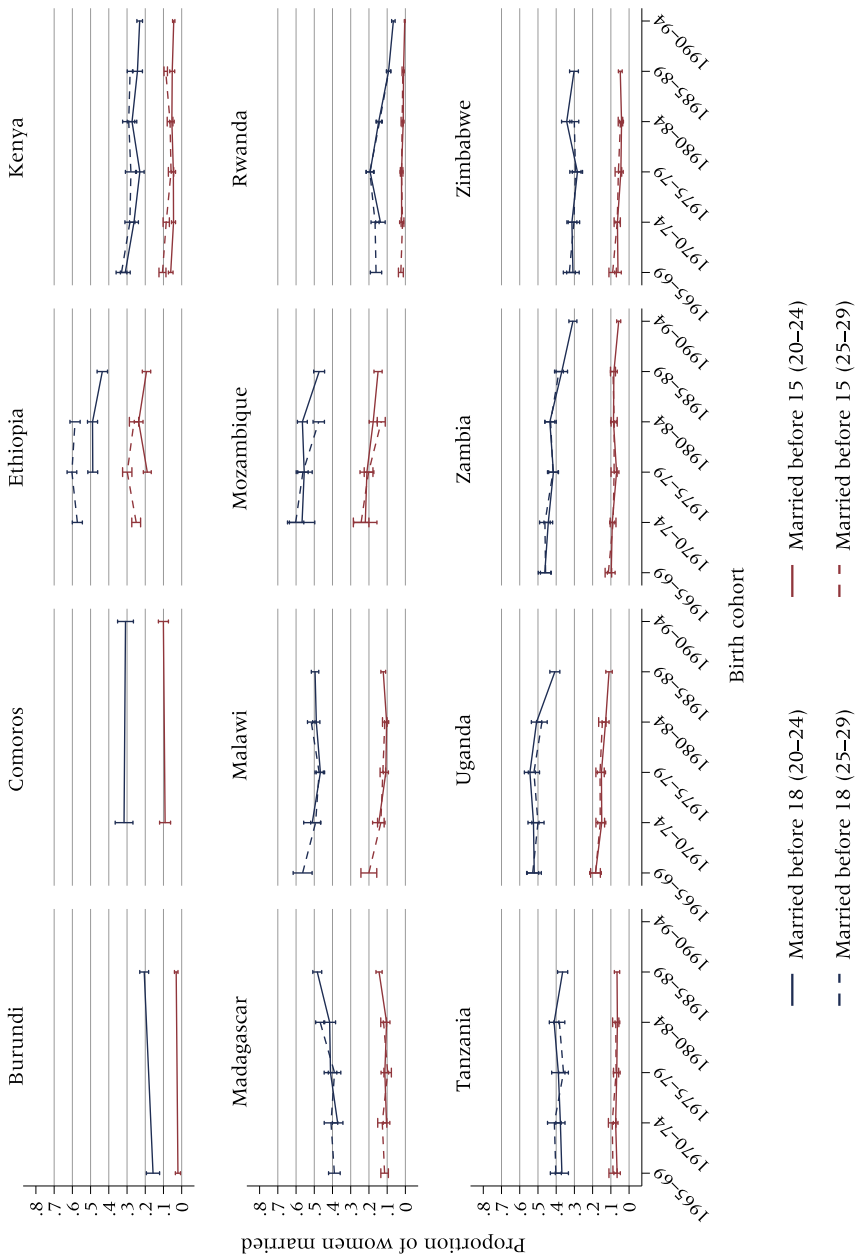
Results

Primary analyses

Trends in the prevalence of child marriage over time are presented by country and geographic region in Figures 1–3. There is striking heterogeneity between and within regions. West Africa has some of the highest rates of child marriage in the world. More than half of women born in the most recent cohort were married before age 18 in four of the 12 countries in this region: Burkina Faso, Guinea, Mali, and Niger (the proportion in Niger exceeds 77 percent). The prevalence of child marriage drops below 25 percent in only two countries in West Africa: Ghana and Togo. Child marriage is relatively less common in East Africa, where Malawi was the only country in which

FIGURE 1 Trends in the prevalence of marriage before 15 and 18 years of age in West Africa, as reported by DHS respondents aged 20–24 and 25–29 years
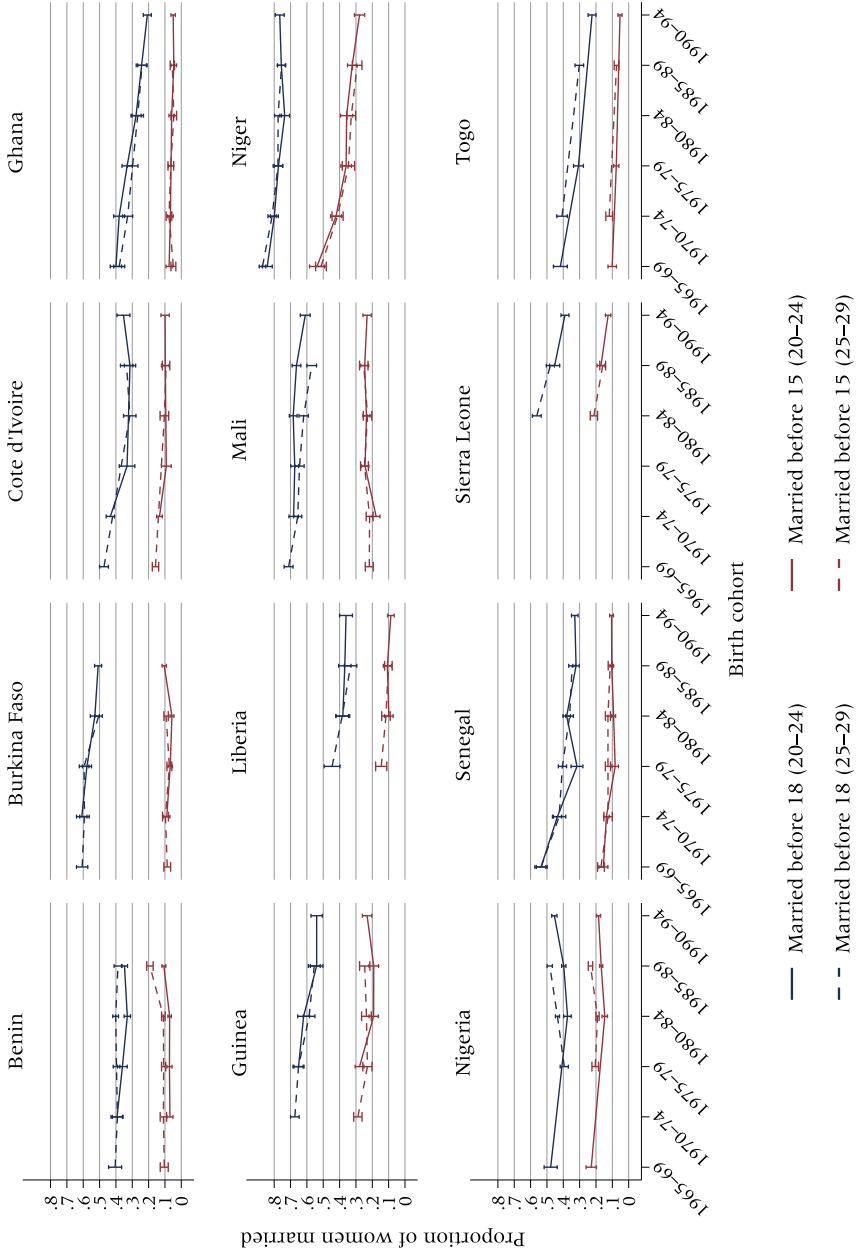

NOTE: Vertical bars represent 95% confidence intervals.

FIGURE 2   Trends in the prevalence of marriage before 15 and 18 years of age in East Africa, as reported by DHS respondents aged 20–24 and 25–29 years

Married before 18 (20–24)

Married before 18 (25–29)

Married before 15 (20–24)

Married before 15 (25–29)

NOTE: Vertical bars represent 95% confidence intervals.

FIGURE 3 **Trends in the prevalence of marriage before 15 and 18 years of age in Central and Southern Africa, as reported by DHS respondents aged 20–24 and 25–29 years**

NOTE: Vertical bars represent 95% confidence intervals.
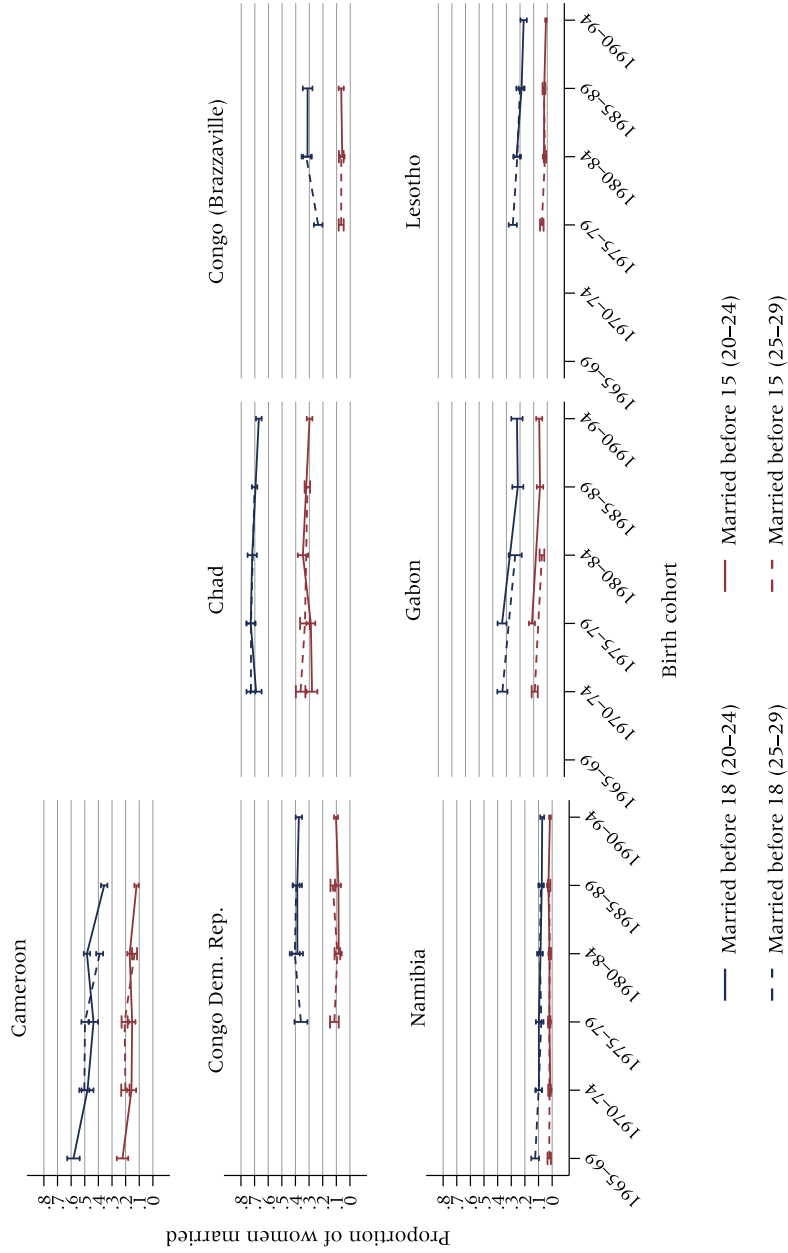
half of women born between 1985 and 1989 reported being married before 18. Fewer than 10 percent of girls born in the same cohort were married as children in Rwanda. Data from Central and Southern African countries are sparse but prevalence estimates vary dramatically within the 1990–94 birth cohort, from a high of 67 percent in Chad to 7 percent in Namibia.

There is clear visual evidence of a decline in the prevalence of marriage before age 18 in many countries, but the pattern of decline differs markedly. Earlier declines appear to have stalled among recent birth cohorts in Cote d'Ivoire, Niger, Senegal, and Kenya, and rates appear to be rising again in Nigeria. In contrast, the prevalence of child marriage has declined only recently in Mozambique, Uganda, and Zambia. Burkina Faso, Ghana, and Togo show evidence of slow but steady reductions over time. On the other hand, we see little or no evidence of a decline in the proportion of girls married before age 18 in Chad, Malawi, Tanzania, Zimbabwe, and Namibia.

Results presented in Table 2 support these conclusions. The table lists the change in the percent of women married before 15 and 18 years of age over a period of 15–20 years. Only countries for which we were able to estimate the prevalence among women born in 1970–74 and either 1985–89 or 1990–94 are listed. The prevalence of marriage before age 18 declined significantly in only 12 of these 20 countries and increased by 11 percentage points in Madagascar over a 15-year period between 1970–74 and 1985–89.

Figures 1–3 also show trends in the prevalence of marriage before the age of 15. More than 20 percent of girls born between 1990 and 1994 were married before age 15 in Mali, Niger, and Guinea. This proportion reaches 30 percent in Chad. In contrast, fewer than 5 percent of girls born in the same cohort were married before age 15 in Kenya, Lesotho, Namibia, and Rwanda. These proportions indicate that the majority of child marriages occur between ages 15 and 17. Although marriage before age 15 is less common, there is also less evidence of a decline in the prevalence of marriage among these very young girls. Of the 20 countries listed in Table 2, we found evidence of a statistically significant decline in marriage before age 15 in only eight. There has been no marked decline in early child marriage in nine countries, and marriage among very young girls has increased by 4 to 6 percentage points over this time period in Benin, Mali, and Madagascar.

As a result of the relatively small changes in marriage before age 15 compared to marriage before age 18, the proportion of child marriages among very young girls has increased in countries such as Burkina Faso, Ghana, Mali, and Cameroon. For example, the prevalence of marriage below the age of 18 has declined substantially in Ghana over a 25-year period, while the prevalence of marriage below age 15 in that country has remained stable. Among women born between 1970 and 1974 and married as children, 18 percent were married before age 15; this proportion rose to 25 percent among women born between 1990 and 1994.

TABLE 2 Change in the percent of women married before 15 and 18 years of age, by country, 1970–89 or 1970–94

Country	Change over period in percent married before 15				Change over period in percent married before 18			
	1970–89	(95% CI)	1970–94	(95% CI)	1970–89	(95% CI)	1970–94	(95% CI)
West Africa								
Benin	**3.7**	**(1.5, 5.9)**			**–4.5**	**(–8.7, –0.4)**		
Burkina Faso	1.5	(–0.8, 3.9)			**–10.0**	**(–13.9, –6.1)**		
Cote d'Ivoire			**–3.4**	**(–6.5, –0.4)**			**–8.0**	**(–12.7, –3.3)**
Ghana			–1.7	(–3.8, 0.5)			**–17.2**	**(–21.4, –13.1)**
Mali			**5.5**	**(2.1, 9.0)**			**–7.1**	**(–11.3, –2.9)**
Niger			**–14.4**	**(–19.0, –9.8)**			–3.3	(–7.0, 0.4)
Senegal			**–3.2**	**(–5.2, –1.1)**			**–10.6**	**(–13.8, –7.4)**
East Africa								
Comoros			0.9	(–3.2, 5.0)			–0.8	(–7.3, 5.7)
Kenya			–0.1	(–1.4, 1.2)			**–3.1**	**(–6.0, –0.3)**
Madagascar	**4.1**	**(1.6, 6.6)**			**11.2**	**(7.4, 15.0)**		
Malawi	–2.4	(–6.1, 1.2)			–1.5	(–6.6, 3.6)		
Mozambique	**–7.0**	**(–13.8, –0.2)**			**–9.4**	**(–17.0, –1.8)**		
Rwanda			**–1.7**	**(–2.8, –0.6)**			**–7.1**	**(–9.9, –4.3)**
Tanzania	–0.8	(–2.7, 1.2)			–1.2	(–5.0, 2.5)		
Uganda	**–4.0**	**(–6.8, –1.2)**			**–11.7**	**(–15.8, –7.6)**		
Zambia			**–3.5**	**(–5.3, –1.8)**			**–13.5**	**(–16.7, –10.3)**
Zimbabwe	–1.6	(–3.3, 0.2)			–1.2	(–4.8, 2.5)		
Central and Southern Africa								
Cameroon	–3.7	(–7.5, 0.0)			**–12.3**	**(–17.2, –7.3)**		
Chad			1.8	(–2.7, 6.2)			–2.0	(–6.6, 2.5)
Namibia			0.2	(–0.9, 1.3)			–2.4	(–5.1, 0.3)

CI: confidence interval.
NOTE: Numbers in bold are significant at p<0.05.

Sensitivity analyses

Our trend estimates are not sensitive to the length of the birth cohort used and are largely robust to the choice of age group. In most cases, estimates based on retrospective reports of age at first marriage from women aged 20–24 and 25–29 born in the same cohort do not differ meaningfully (Figures 1–3). In the few countries in which we do observe slight differences between age groups, such as Mali, Nigeria, and Ethiopia, trends over time are in the same direction. It is noteworthy that the level of child marriage based on reports from women aged 25–29 is higher than the level based on reports from women aged 20–24 in Benin, Nigeria, and Ethiopia. This finding does not correspond to our initial hypothesis that forward displacement bias would result in smaller estimates from older women. Although the difference in age at the time of interview is small, the discrepancy between the two groups suggests that in these countries our estimates of the proportion of women married as children may be conservative.

We did not anticipate finding an increase in the prevalence of child marriage, especially before the age of 15. We examined sub-national trends in Madagascar and Mali to ensure that the observed increases are not attributable to changes in the DHS sample over time (results not shown). All of the provinces in Madagascar were represented in each of the DHS waves used in this analysis, and the prevalence of marriage before ages 15 and 18 appears to have increased steadily in some of them between 1970 and 1989. The increase in the prevalence of very early marriage in Mali occurred between women born in 1970–74 and those born in 1975–79; no further change has been observed among more recent birth cohorts. The district with the highest estimated prevalence of child marriage in the country, Kidal, was not represented in the 1970–74 birth cohort. However, our results are not sensitive to this omission: we found that the prevalence of marriage before age 15 still increased significantly even after dropping all data from Kidal from our analysis. Changes in the composition of administrative units in Benin over time prevented us from examining sub-national trends.
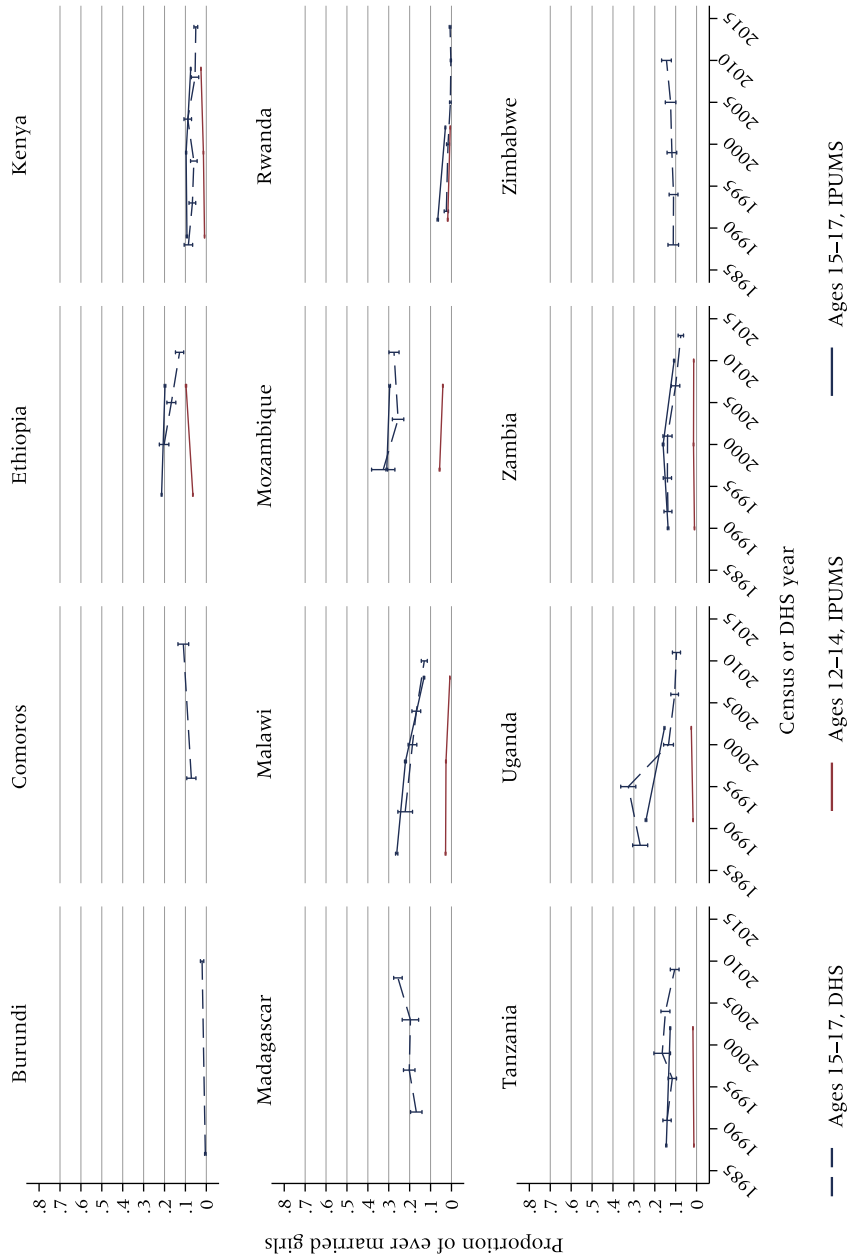
Estimates of the proportion of ever-married girls between ages 12–14 and 15–17 across survey and census waves are shown in Figures 4–6. In most countries trends based on cross-sectional measures tell the same story as trends based on retrospective reporting of age at first marriage. It is important to note than in some countries, estimates from the most recent survey or census reflect trends among women born in more recent years than those included in our primary estimates shown in Figures 1–3. This is the case in Ghana, Ethiopia, Malawi, and Cameroon, where estimates of trends in the prevalence of child marriage differ depending on whether we measure changes over birth cohorts or over census/survey year. For example, based on our primary analysis we concluded that there had been

FIGURE 4 Proportion of ever-married girls aged 12–14 and 15–17 years included in DHS and census waves in West Africa
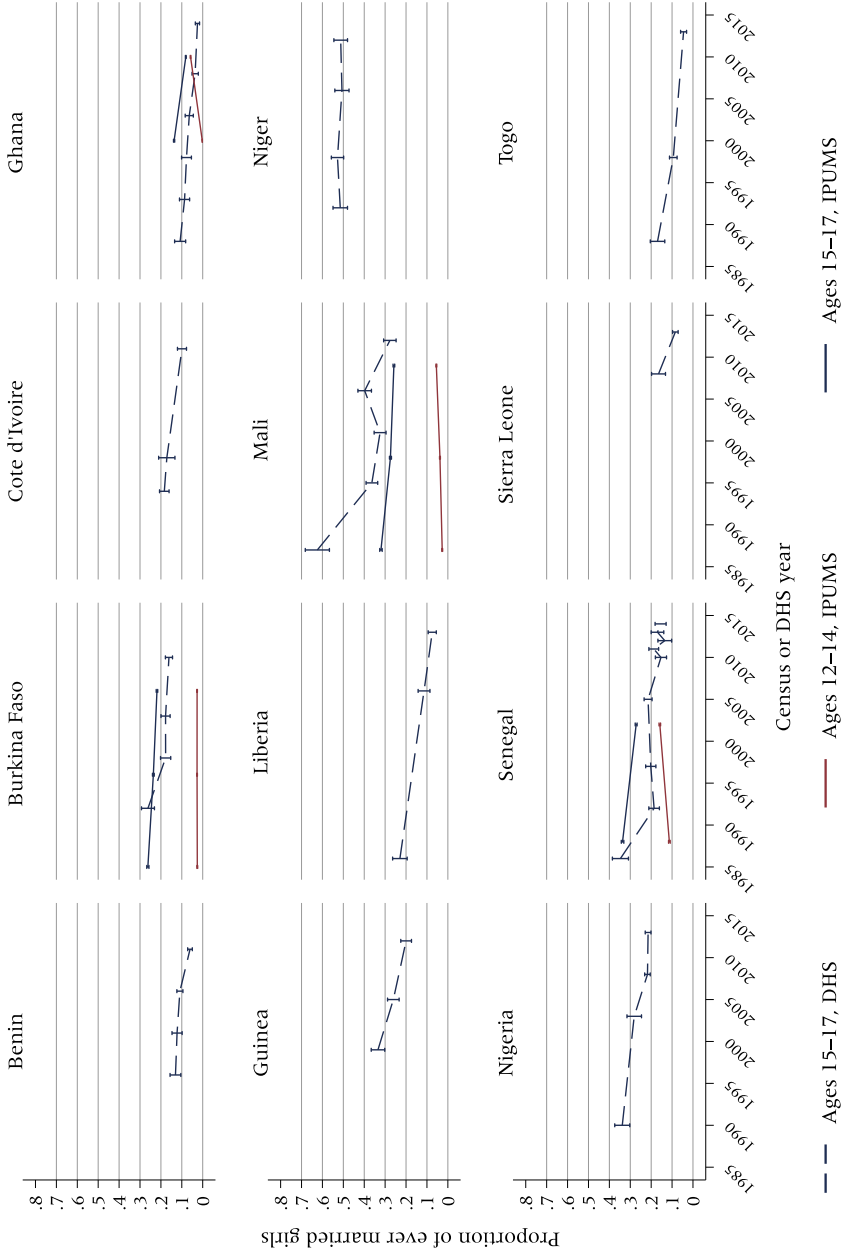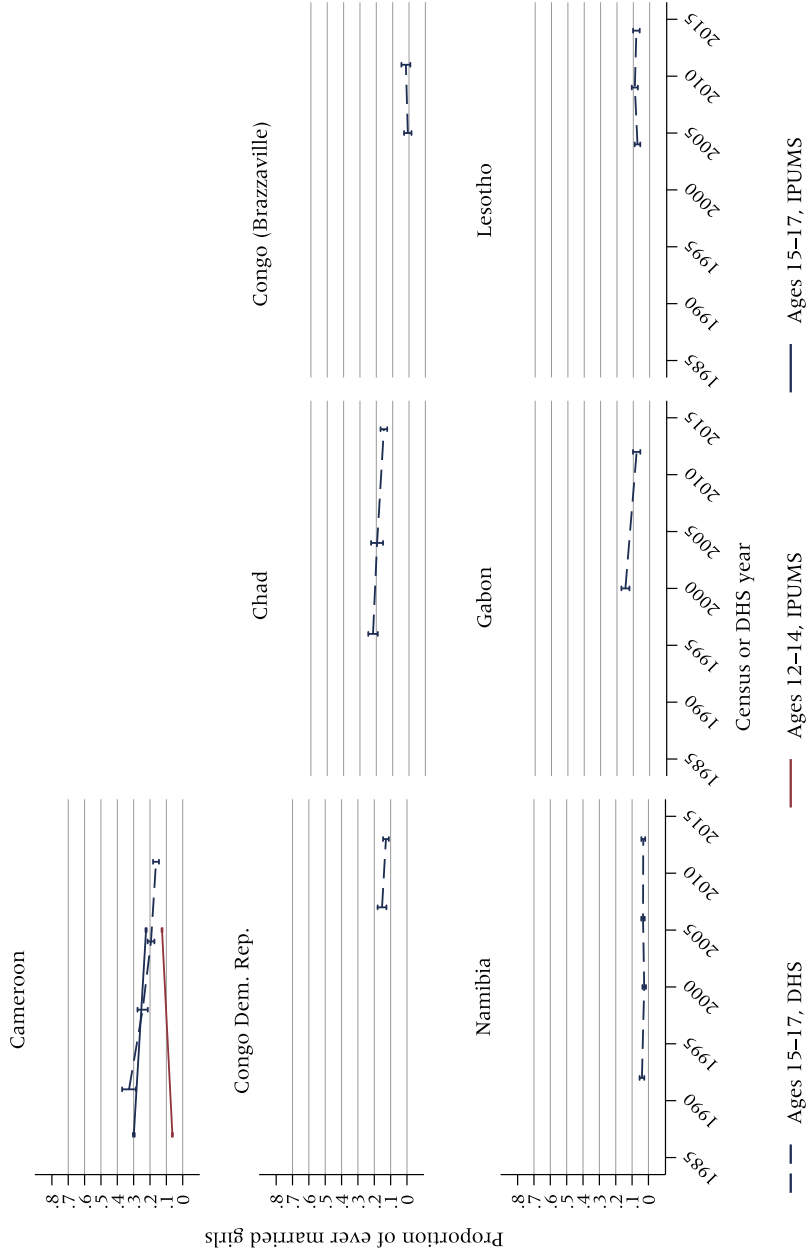

NOTE: Vertical bars represent 95% confidence intervals.

FIGURE 5 Proportion of ever-married girls aged 12–14 and 15–17 years included in DHS and census waves in East Africa

NOTE: Vertical bars represent 95% confidence intervals.

FIGURE 6 Proportion of ever-married girls aged 12–14 and 15–17 years included in DHS and census waves in Central and Southern Africa

NOTE: Vertical bars represent 95% confidence intervals.

no change in the prevalence of marriage before age 18 in Malawi over a 15-year period spanning birth cohorts from 1970–74 to 1985–89. However, cross-sectional estimates based on DHS and census data shown in Figure 5 indicate a decline in the proportion of ever-married girls aged 15–17. The most recent DHS in Malawi was conducted in 2010, and girls aged 15–17 interviewed in that survey were born between 1992 and 1995, birth years that are not represented in the estimates shown in Figure 2. The same is true of census data: girls aged 15–17 recorded in the 2008 census would have been born between 1990 and 1993. This suggests that it might have been possible to observe a very recent decline in marriage before 18 years of age in Malawi if we could have extended our primary estimates. Notably, census data in Malawi indicate that the prevalence of marriage among girls aged 12–14 has not declined even among more recent birth cohorts.

Cross-sectional estimates from censuses in Cameroon, Ethiopia, and Ghana indicate increases in the proportion of ever-married girls aged 12–14 that are not reflected in estimates of marriage before age 15 based on DHS data. In these three countries, girls aged 12–14 recorded in the most recent census were born in years too recent to be represented in our primary DHS estimates. Given the generally high level of correspondence between estimates shown in Figures 1–3 and census data in other countries, this suggests that marriage among very young girls could be on the rise in those countries as well. However, these results must be interpreted with caution as the time period under evaluation differs between measurement approaches, and estimates of change are sensitive to these differences. This is illustrated in Senegal, where we note a similar discrepancy. Estimates based on retrospective reports of age at first marriage from women aged 20–24 indicate that the prevalence of marriage before age 15 declined by 3 percentage points in Senegal between 1970 and 1994 (Figure 1, Table 2). However, using census data we estimated that the proportion of ever-married girls aged 12–14 increased by 4 percentage points between the censuses conducted in 1988 and 2002 (Figure 4). Thinking in terms of birth cohorts, results from census data can be interpreted as the difference in the proportion of ever-married girls aged 12–14 born over an approximately 15-year period between 1974 and 1990. Upon further investigation using DHS data to measure the change in the prevalence of marriage before age 15 reported by women who were interviewed at ages 20–24 and born between 1974–76 and 1988–90 (roughly corresponding to birth cohorts for girls aged 12–14 recorded in the two censuses), we found a slight increase.

Finally, we compared our estimates of change in the proportion of women married before 18 years of age to estimates obtained by comparing women interviewed at different ages using a single DHS wave. Results from the two measurement techniques are remarkably similar, as shown in Table 3. Estimates of change in the prevalence of child marriage over a 20-year period differed by less than 5 percentage points in all of the

TABLE 3 Changes in the percent of women married before 18 years of age over the 20-year period 1970–74 to 1990–94 measured using two different techniques: an age group comparison that uses a single DHS wave and a birth cohort comparison that uses women interviewed at ages 20–24 in multiple waves

| Country | Age group comparisons using a single DHS wave | | | | Birth cohort comparisons using pooled DHS data | | | |
	DHS year	Ages 20–24	Ages 40–44	Change over time	DHS years	Born 1990–94	Born 1970–74	Change over time
West Africa								
Ghana	2014	20.7	35.2	–14.5	1993, 1998, 2014	20.8	38.0	–17.2
Senegal	2014	32.3	40.4	–8.1	1992, 1997, 2010–14	33.0	43.6	–10.6
East Africa								
Kenya	2014	22.9	30.5	–7.6	1993, 1998, 2014	23.0	26.2	–3.2
Rwanda	2014	6.8	18.1	–11.3	1992, 2010, 2014	6.6	13.7	–7.1
Zambia	2013	31.4	48.4	–17.0	1992, 1996, 2013	30.8	44.3	–13.5
Central and Southern Africa								
Chad	2014	66.9	67.8	–0.9	1996, 2014	67.1	69.1	–2.0
Namibia	2013	6.9	8.7	–1.8	1992, 2013	7.3	9.7	–2.4

countries studied. In Ghana, Senegal, Chad, and Namibia, we estimated slightly larger declines in the prevalence of child marriage when comparing women from different birth cohorts. However, in Kenya, Rwanda, and Zambia the birth cohort comparison yielded smaller measures of change than estimates based on the comparison of age groups from a single DHS survey. These results yield no consistent indication of forward displacement bias across this sample of countries.

Discussion

Marriage before age 18 has become less common throughout much of sub-Saharan Africa, but more than one third of girls continue to marry before reaching adulthood in well over half of the countries examined in this study. Early progress toward reducing child marriage has not been sustained in some of these countries, and the prevalence has remained essentially unchanged for 20 years in seven of them, including Chad and Niger, which have the highest prevalence of child marriage in the region. In contrast to the rising mean age at marriage observed throughout sub-Saharan Africa, these findings suggest that age at marriage is not rising uniformly within individual countries. Some segments of the population still marry at very young ages, while others continue to delay marriage until increasingly later ages.

Decreases in the prevalence of child marriage have been concentrated among girls aged 15–17 years. More than half of the countries we examined showed no significant progress toward reducing the prevalence of marriage among girls younger than 15 (Table 2). This lack of progress indicates resistance to delaying marriage among the youngest and most vulnerable girls. This situation is particularly evident in Burkina Faso and Ghana, where marriage before age 18 has declined by 10 and 17 percentage points, respectively, while there has been no change in the prevalence of marriage before age 15 over the same 20-year period. Even in countries where declines have occurred, they have been small. Of 20 countries examined, Niger and Mozambique were the only two in which the prevalence of marriage before age 15 declined by more than 5 percentage points. The prevalence of marriage among very young girls has risen significantly in Benin, Mali, and Madagascar.

We attempted to avoid known sources of bias in the measurement of age at marriage by comparing women who were interviewed at the same age across birth cohorts. However, perceptions of marriage have likely changed over the time period examined in response to social forces advocating improved educational and labor force opportunities for women, as well as the adoption or reform of minimum-age-at-marriage laws and anti–child marriage campaigns. It is plausible that women born and interviewed in more recent years feel greater pressure to report that they were older at

the time of their marriage than they actually were, potentially leading to changes in the degree of measurement error over time that could bias our conclusions. Importantly, though, if women born in recent cohorts are more likely to falsely report that they were 18 or older at the time of marriage, then we would expect our results to overestimate reductions in the prevalence of child marriage. We see few signs of this in our results, particularly among very young girls.

High levels of child marriage persist throughout much of sub-Saharan Africa despite legislative efforts to prevent the practice. By 2010, 25 of the 31 countries in our analysis had set a minimum legal age for marriage at 18 years or older (United Nations 2011b). Guinea, Niger, Togo, Chad, the Democratic Republic of Congo, and Zimbabwe were exceptions and had legal minimums between 15 and 17 years of age. All 31 countries permit exceptions to the minimum in the case of consent from parents or religious or judicial authorities (United Nations 2011a, 2011b; WORLD Policy Analysis Center 2016). Although these laws represent an important precedent for the protection of human rights, our estimates suggest that they are insufficient to eliminate the practice. Given the numerous exceptions to the minimum age, even rigorous enforcement of existing laws is unlikely to eliminate child marriage.

A recently published systematic review found that providing incentives for girls' education was one of the few interventions that have been shown to effectively prevent child marriage (Kalamar, Lee-Rife, and Hindin 2016). Many of the studies included in that review were conducted in sub-Saharan Africa. Randomized evaluations in Kenya, Malawi, and Zimbabwe found that reducing the cost of schooling by providing school fees, uniforms, or cash transfers conditional on attendance reduced the incidence of child marriage (Duflo et al. 2006; Baird et al. 2010; Baird, McIntosh, and Özler 2011; Baird et al. 2012; Hallfors et al. 2015). A pilot program in Ethiopia that provided girls with mentorship and economic incentives to remain in school and facilitated community discussion about the harms associated with child marriage was the only study to differentiate between effects on marriage among very young girls and effects among older adolescents. The proportion of girls between ages 10 and 14 who were married dropped by approximately 8 percentage points after a two-year follow-up period, although the program had no measurable effect on the marriage of girls between ages 15 and 19 (Erulkar and Muthengi 2009).

There is a long way to go before child marriage is eliminated and Sustainable Development Goal 5 can be attained. Additional research is needed to better understand the social patterning of child marriage within sub-Saharan Africa and across the globe. In particular, we must learn more about what characterizes marriage among the youngest girls and the social forces that perpetuate it in the face of a rising trend in the average age at marriage throughout most of sub-Saharan Africa. The lack of progress over a 20-year

period in some countries highlights the need for innovative interventions aimed at delaying marriage. There is strong evidence based on data from sub-Saharan Africa that providing financial incentives for girls' education can reduce child marriage. Scaling up the pilot programs described in these studies may achieve results that legislative efforts have thus far been unable to produce, but this will require a willingness on the part of governments and donors to implement and fund such interventions. Improving educational opportunities for girls has the potential to bring about benefits far beyond delayed entry into marriage and will likely advance progress toward a host of additional development goals, but careful attention must be paid to ensure that all girls have access to these opportunities.

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