Using Retrospective DHS Data to Investigate Reproductive Experiences of Very Young and Older Adolescents Age 10-19

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Short Abstract

Demographic and Health Surveys (DHS) provide data for women of reproductive age 15-49, including adolescents age 15-19. However, these data are infrequently used to examine younger adolescents age 10-14. This study exploits retrospective, longitudinal schedules in 52 DHS surveys—namely birth histories and contraceptive calendars—and adjust for censored observations among women age 15-24 to estimate fertility rates and contraceptive use during the full range of adolescent years from age 10-19.

Contraceptive use is rare during early adolescence but increases with age to about 20% among women age 15-19. Age-specific fertility rates are imperceptible among the youngest adolescents. The earliest detectable adolescent fertility occurs at age 13-14 in the countries with highest fertility. Although these events are rare, this study shows that it is possible to calculate contraceptive use and fertility rates for even the youngest adolescents (age 10-14) using existing data sources like the DHS.

1. Introduction

Adolescence is typically defined as the period of life between age 10 and age 19 and entails numerous social and biological milestones in the transition from childhood to adulthood (Lloyd 2005; WHO 1989). In health and development efforts, much attention is rightly focused on older adolescents age 15-19 because many adolescents this age are initiating those experiences and behaviors associated with adulthood such as sexual activity, marriage, and childbearing (Kothari et al. 2012). Research on this age group also benefits from the availability of data. Since the demographic community has established consensus as age 15-49 as the reproductive span for women, most datasets, the Demographic and Health Surveys (DHS) included, comprise data on adolescents age 15-19.

Recently, there have been calls to invest more in younger adolescents, both in order to prepare them for a healthier later adolescence and adulthood and in recognition that some may already have reproductive experiences frequently associated with older adolescents (Igras et al. 2014; Patton et al. 2016; UNFPA 2016). These calls have been echoed with requests for more data on this age group to better understand their current situation and needs (Brady 2011; Engebretsen 2012; Lundgren and Amin 2015; McCarthy, Brady, and Hallman 2016; WHO 2011; Woog and Kågesten 2017).

To date, The DHS Program has not responded to these calls for additional data by expanding their samples to collect data directly from respondents age 10-14. In most situations, interviewing respondents younger than age 15 is neither cost effective nor free of logistical and ethical challenges (Brady 2011; Way 2014). However, existing data have substantial—and largely untapped—potential to be gleaned to characterize the lives of younger adolescents age 10-14 (Way 2014; WHO 2011). This study exploits existing longitudinal schedules in DHS surveys in innovative ways to analyze the reproductive experiences for the full adolescent age range from age 10 to age 19. Further, it demonstrates these innovations with respect to age-specific fertility rates and contraceptive experience of adolescents in 52 surveys.

2. Methods and Data

DHS surveys contain two types of retrospective data: stand-alone retrospective questions and longitudinal schedules that cover a preset period of time preceding the survey. The two longitudinal schedules used by the DHS surveys are the contraceptive calendar and birth histories. The contraceptive calendar records month-by-month, retrospective information on episodes of contraceptive use or non-use and other reproductive events for (typically) 5 completed years preceding the survey[1].

The contraceptive calendar records (1) pregnancies, births, and terminations,[2] (2) episodes of contraceptive use, and (3) episodes of no contraceptive use[3]. This involves working from the month of the interview to the beginning of the calendar period (ICF International 2015). The contraceptive calendars of women who are age 15-24 at the time of the interview describe the contraceptive experiences when the women were adolescents age 10-19, as illustrated in the Lexis diagram below.

Birth histories record all births[4] that women experience in their lifetime. The birth history records the year, month, and day[5] of birth, age, survival status, co-residence, and singleton/multiple status. More detailed information is collected on maternal and child health indicators for children born in the previous 5 years. Births in the 5 years preceding the interview are also entered in the contraceptive calendar. Birth histories place all births within or outside

[1] The exact length of the contraceptive calendar is determined by the duration of data collection and the month in which the respondent is interviewed.
[2] Terminations may include induced abortions, miscarriages, and stillbirths.
[3] An alphabetic P, B, or T code indicates that the respondent experienced a pregnancy, birth, or termination in that month. A numeric code 1-9 or alphabetic code J-Y indicates the method of contraception used. The numeric code 0 indicates that the respondent was not using any method of contraception, and was not experiencing a pregnancy, birth, or termination.
[4] In a few cases, a pregnancy history is administered rather than a birth history.
[5] Prior to 2015, only year and month of birth were collected.

of adolescence for all women. Data from women age 15-24 on births in the previous 5 years refer to births that occurred when the women were adolescents age 10-19.

In this study, we examine birth history and contraceptive calendar data among youth age 15-24 in order to describe the fertility and contraceptive experiences of the most recent cohort of adolescents. We draw on data from DHS surveys conducted since 2010 in 52[6] countries.

2.1. Calculation of Adolescent Fertility Rates

This study includes age-specific fertility rates for five-year age intervals 10-14 and 15-19 and single-year rates for ages 10 through 19, based on exposure and births during the 5 years (60 months) before the survey.

The calculations for the grouped age interval 15-19 and single year ages 15 through 19 are completely consistent with standard DHS practice. That is, contributions to the numerators (births) and denominators (exposure) come from the birth histories for women age 15-24 at the time of the survey, which comprise all the births and exposure to the risk of a birth while age 15-19 in the past 5 years. Women age 20-24 contribute about half of the exposure and women age 15-19 contribute the remainder.

The calculations for age interval 10-14 and single years age 10 through 14 require modifications because the rates are limited to contributions from women age 15-19 at the time of the survey, who represent about half of the total births and exposure.

In the Lexis diagram below, the blue-shaded parallelogram shows the exposure, of women who were age 15-19 at the time of the survey, to age 10-19 during the 5 years before the survey. The gray triangle at the upper left would be filled by contributions to the rate for ages 15-19 from women age 20-24 at the time of the survey, referred to above. The gray triangle at the bottom right of the figure shows the combinations of age and time for which the survey respondents cannot provide any information. This absence of any data in the gray triangle at the bottom right is described as censoring due to the age 15 cutoff for eligibility in DHS questionnaires.

Our procedure to deal with the censoring at age 15 is as follows. First, for the single year rates, we simply divide the births by the exposure, corresponding to the blue areas in the rows for ages 10, 11, 12, 13, and 14. No adjustments are made, although the information is incomplete; this is exactly what would be done for single-year rates at any age. The diagram shows almost complete exposure to age 14, because within the 5 years before the survey, the birth histories for women age 16, 17, 18, and 19 at date of interview will all include a full year of exposure and births while age 14, and the only loss of exposure is half a year for those women who were age 15 at the time of the survey. In effect, we assume that the missing half year would have the same expected ratio of births to exposure as what we observe. The rate for age 14 is 90% complete.

Similarly for the other single year rates, the rate for age 13 is 70% complete; the rate for 12 is 50% complete; the rate for age 11 is 30% complete; and the rate for age 10 is 10% complete. The rates for ages 10 and 11 have the least data, but these rates are the lowest. The time period to which the data refer moves steadily backward for the lower ages. The data for age 10 are located entirely in the fifth year before the survey.

Second, we want to calculate a rate for ages 10-14 in the past 5 years. If we were to divide the observed number of births by the observed woman-years of exposure in the lower left blue triangle, the five-year rate would be biased toward the ages with the most data. Failing to correct for this bias toward data from later ages would produce fertility rates that overestimate fertility in the age group.

Therefore, we weight the exposure to each year of age in inverse proportion to its completeness. To be specific, say that R is the five-year rate for ages 10-14 and r10 through r14 are the single-year rates for ages 10 through 14, calculated as just described. The woman-years of exposure to each year of age, in the birth histories, is E10 through E14. Then R is calculated as

[6] The contraceptive calendar was administered in 41 countries.

$$R = \frac{\left[B10 + \left(\frac{B11}{3}\right) + \left(\frac{B12}{5}\right) + \left(\frac{B13}{7}\right) + \left(\frac{B14}{9}\right)\right]}{\left[E10 + \left(\frac{E11}{3}\right) + \left(\frac{E12}{5}\right) + \left(\frac{E13}{7}\right) + \left(\frac{E14}{9}\right)\right]}.$$

This R yields a good estimate of the usual five-year rate that would be produced if we had birth histories for women age 10-14 at the time of the survey, unless there was a large amount of temporal variation in the underlying birth probabilities for single years of age 10 to 14 within the past 5 years.

Two other types of weights that are involved in all estimates of fertility rates deserve mention here. First, every case is weighted by the sample weight, (v005), which is inversely proportional to the sampling probability for that case. The sample weights correct for under-sampling and over-sampling in the survey design and for differential non-response.

Second, in samples that are limited to ever-married women, the sample weights are multiplied by an "all-women factor" (awfactt), which compensates for omission of women, especially young women, who were omitted from the survey because it was determined in the household questionnaire that they had never been married. The all-women factor inflates the denominators of the fertility rates, in effect adding exposure to the risk of childbearing for the omitted women, but leaves the numerators unchanged, because of an assumption that women do not have any births prior to marriage. The fertility rates in this study to which this weight applies are those from the following surveys: Afghanistan 2015, Bangladesh 2014, Egypt 2014, Jordan 2012, and Pakistan 2012-13.

2.2. Calculation of Adolescent Contraceptive Prevalence

Contraceptive experience of adolescents is similarly estimated using contraceptive calendar data from women age 15-24, represented by the blue parallelogram and the upper grey triangle in the Lexis diagram. This study presents several contraceptive experience indicators. First, it presents the proportion of women who used any method of contraception during the ages 10-14 and 15-19. Second, survival analysis methods (e.g. cumulative incidence functions and hazard models) are employed to determine the age of first contraceptive use and factors associated with method of first use. Such methods account for the type of censoring to observations depicted by the lower right grey triangle in the Lexis diagram (Box-Steffensmeier and Jones 2004; Cleves et al. 2010).

Like the fertility rates, measures of contraceptive prevalence are estimated using sampling weights and account for the complex sampling design in DHS surveys. Unlike the fertility rates, however, the "all-women factor" (awfactt) is not used to adjust ever-married women samples because an assumption that never-married women do not use contraception may not be empirically supported (MacQuarrie 2014). Instead, results are presented separately for these two groups of women.

3. Preliminary Results and Conclusions

Figures 2 and 3 show that contraception is rarely used during the early adolescent years with nearly all study surveys registering well below 10% of women used any method of contraception between age 10-14. Peru and Bangladesh are the exceptions, 23% of all women (Peru) and 19% of ever-married women (Bangladesh) report having used contraception between age 10-14.

Contraceptive use during age 15-19 is comparably higher in most study surveys and reaches close to 20% of women or higher in 15 surveys of all women. During these ages, contraception is again highest in Peru (66%) and noticeably more common in the three other Latin American and Caribbean countries, Colombia (57%), Honduras (47%), and Guatemala (26%), and in Namibia (43%), Liberia (41%), Zimbabwe (35%), and Malawi (33%). In all five surveys of ever-married women, contraceptive use ranges from about 11% of ever-married women age during age 15-19 in Afghanistan and Pakistan to 26% in Egypt and Jordan and the majority of women in Bangladesh (60%).

Figure 4 shows that fertility is negligible in the youngest age group, 10-14, in all countries, as compared to fertility among women age 15-19. ASFR are consistently compressed in a narrow range close to zero. Within this narrow band, the highest ASFR for women age 10-14 are in West Africa followed by Southern and Middle Africa. Mali has the highest ASFR with 17 births per 1,000 women age 10-14 followed by Angola (11) and Guinea (10). Bangladesh

(9) and Mozambique (6) stand out for having higher than average early adolescent fertility rates for their regions. In most North African, West and Central Asian countries and many South and Southeast Asian countries, ASFR are nearly immeasurable for women age 10-14. Among the older adolescents, the ASFR varies considerably from a high of near 200 births per 1,000 women in Niger (210) and Chad (197) to a low of near 25 births in Armenia (28) and Jordan (27).

ASFR for women age 15-19 well predicts ASFR for women age 10-14 (Figure 5.)

Figure 6 shows fertility curves (and their 95% confidence bands) of single-year ASFR for women age 10-19 for the two countries in each region with the highest and the lowest adolescent fertility rates. Figure 6 shows the wide range in adolescent fertility rates within each region. It indicates that among the highest adolescent fertility countries in the three African regions, Niger, Mozambique, and Chad, and Bangladesh in South and Southeast Asia, fertility begins to rise steeply from age 14-15 through the later adolescent years, but levels out between ages 18 and 19. In all other countries shown here, there is a more steady, albeit more gradual, increase in the age-specific fertility rates through the mid and older adolescent ages.

Figure 7 shows provides a closer look at the fertility curves for those age 10-14 for the two countries in each region with the highest early adolescent fertility rates. In none of these countries with the earliest onset of fertility is there measurable fertility prior to age 12. These figures indicate some variation in the onset of fertility both within and across regions after age 12. There is some fertility by age 13 in Mali (but not Côte d'Ivoire) and Bangladesh (but not Nepal) and, to a lesser extent, in both Angola and Gabon. In all other regions, fertility does not begin until age 14. Fertility among very young adolescents, even by age 14 for example, is even less apparent in North Africa, West and Central Asia (Tajikistan and Yemen), Latin America and the Caribbean (Honduras and Guatemala), and in Nepal and the Comoros.

This study shows that it is possible to calculate contraceptive use and fertility rates for even the youngest adolescents (age 10-14) using existing data sources like the DHS. The longitudinal schedules contain the necessary data on both the exposure and events of interest (in this case, births and contraceptive use) but are under-utilized for these purposes. Nonetheless, our analyses reveal that births and contraceptive use are both rare among adolescents and, particularly, young adolescents.

Fig 1. Lexis Diagram showing the exposure, in blue, of women age 15-19 at the time of a survey, to ages 10-19 during the 5 years before the survey

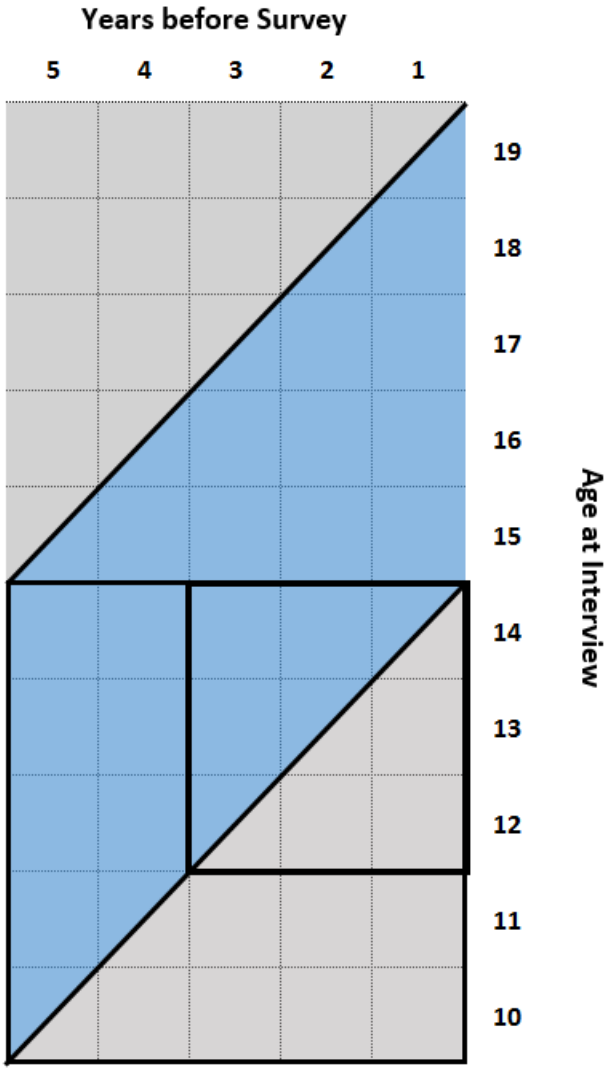

Fig 2. Percent of women age 15-24 who used contraception in the 5 years preceding the survey during age 10-19 (all women surveys)

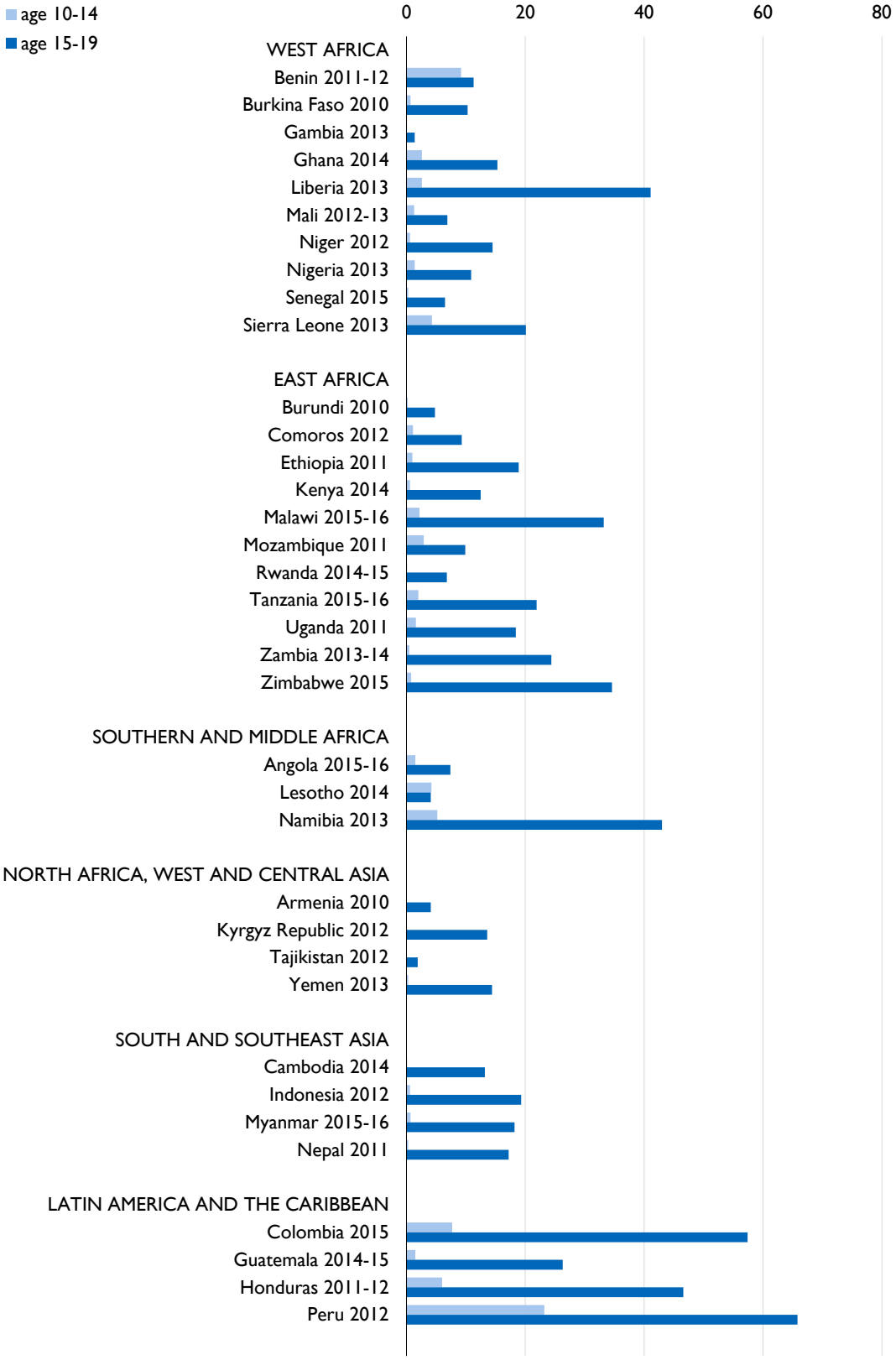

Fig 3. Percent of women age 15-24 who used contraception in the 5 years preceding the survey during age 10-19 (ever-married surveys)

Fig 4. Adolescent age-specific fertility rates, grouped ages 10-14 and 15-19

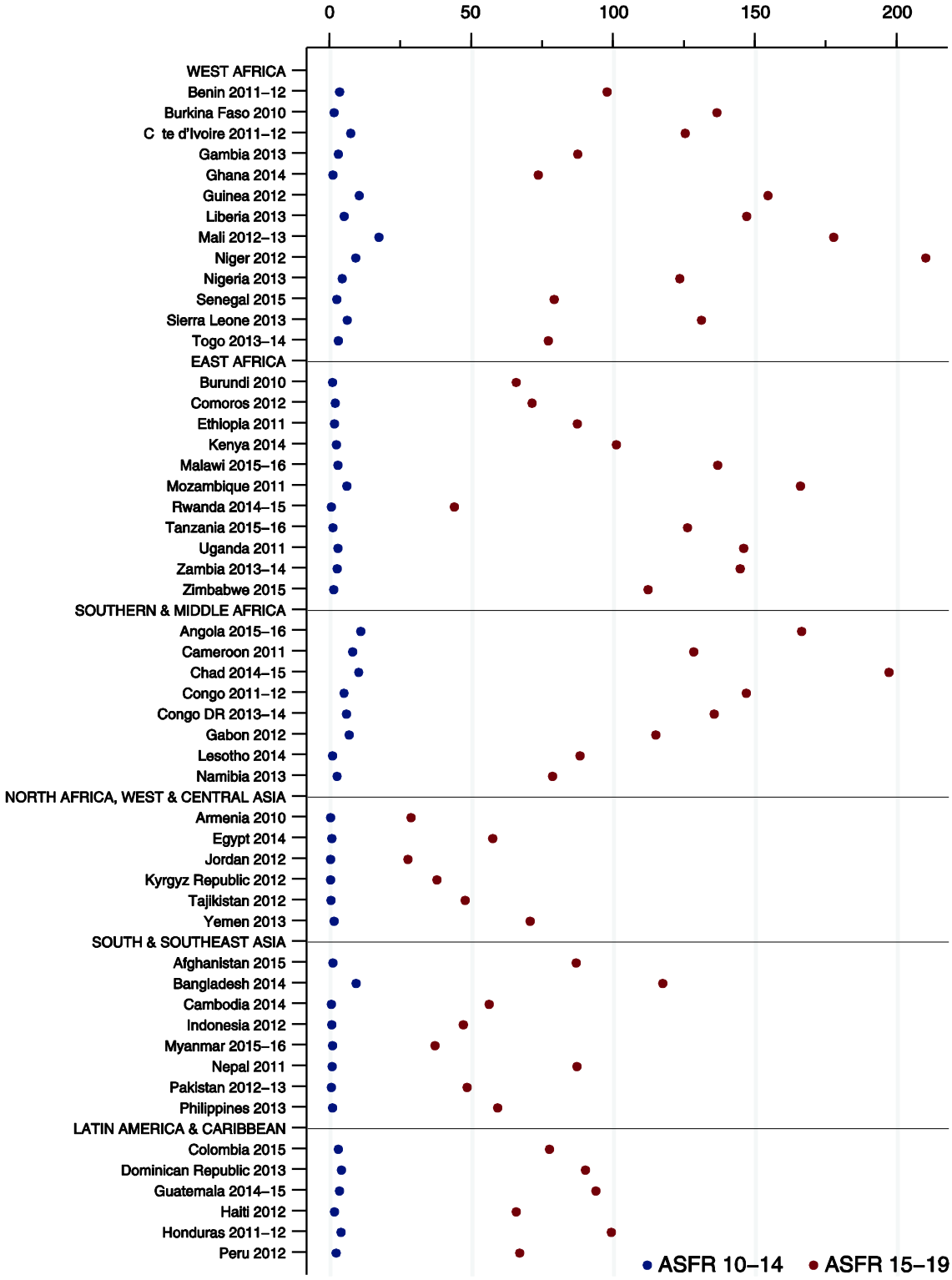

Fig. 5. Age-Specific Fertility Rates for Women Age 10-14 and Age 15-19

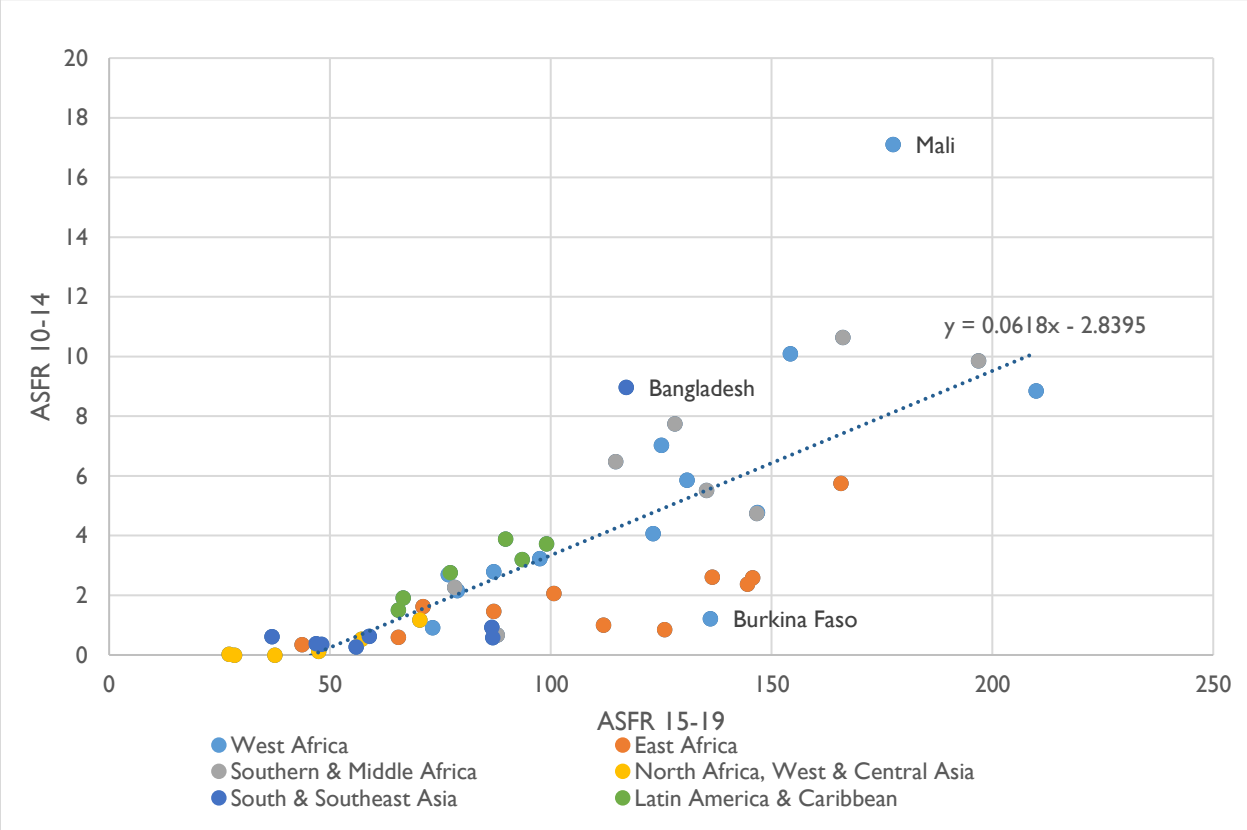

Fig 6. Adolescent fertility curves, selected countries

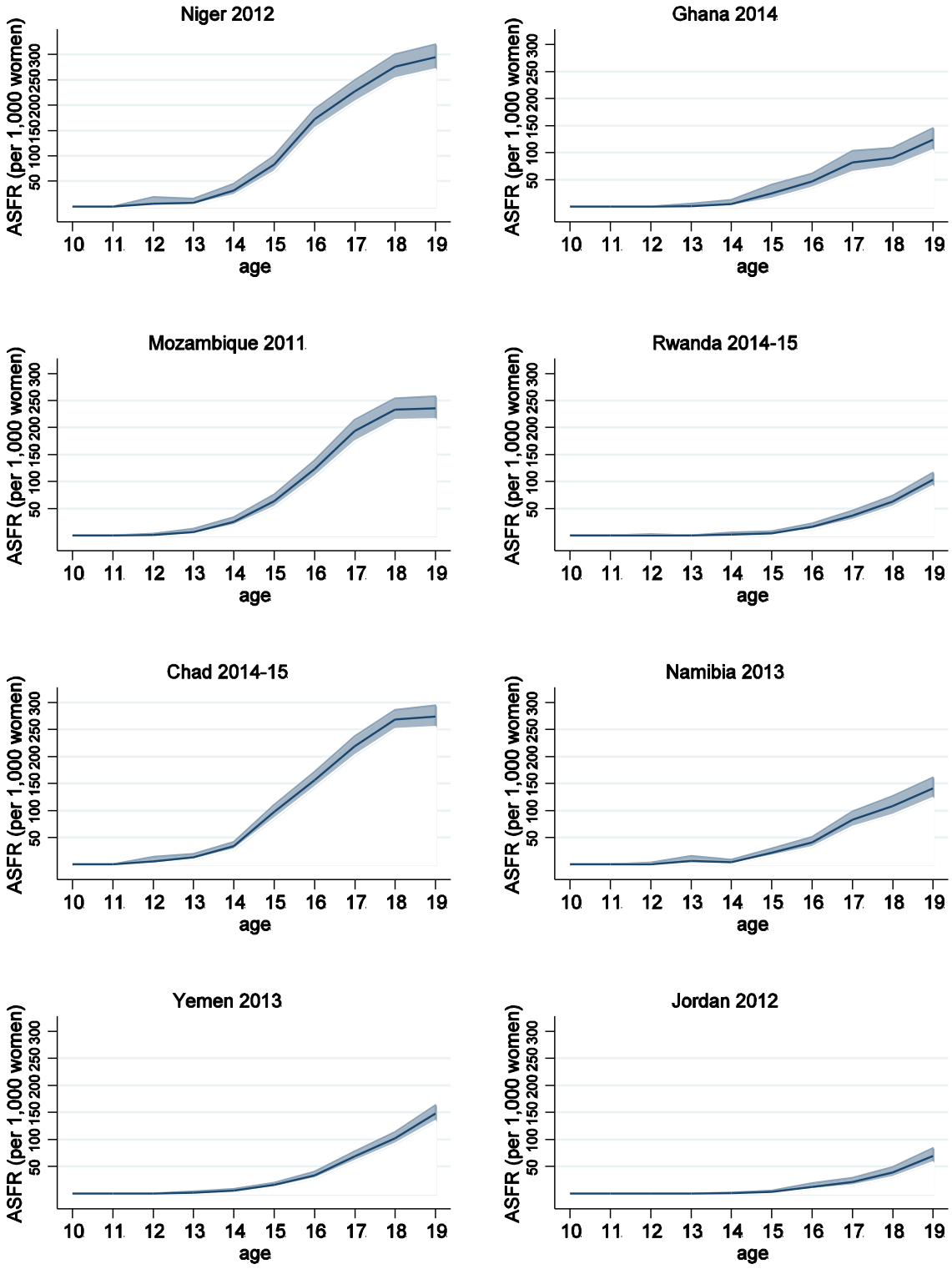

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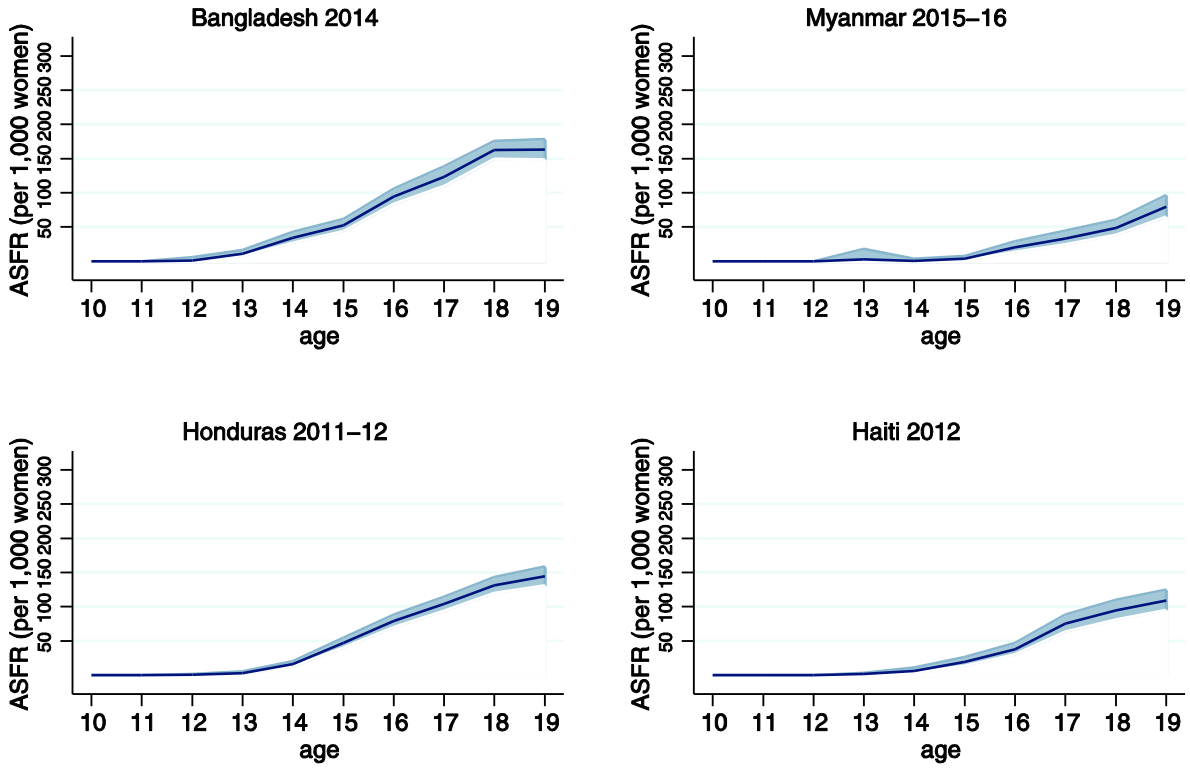
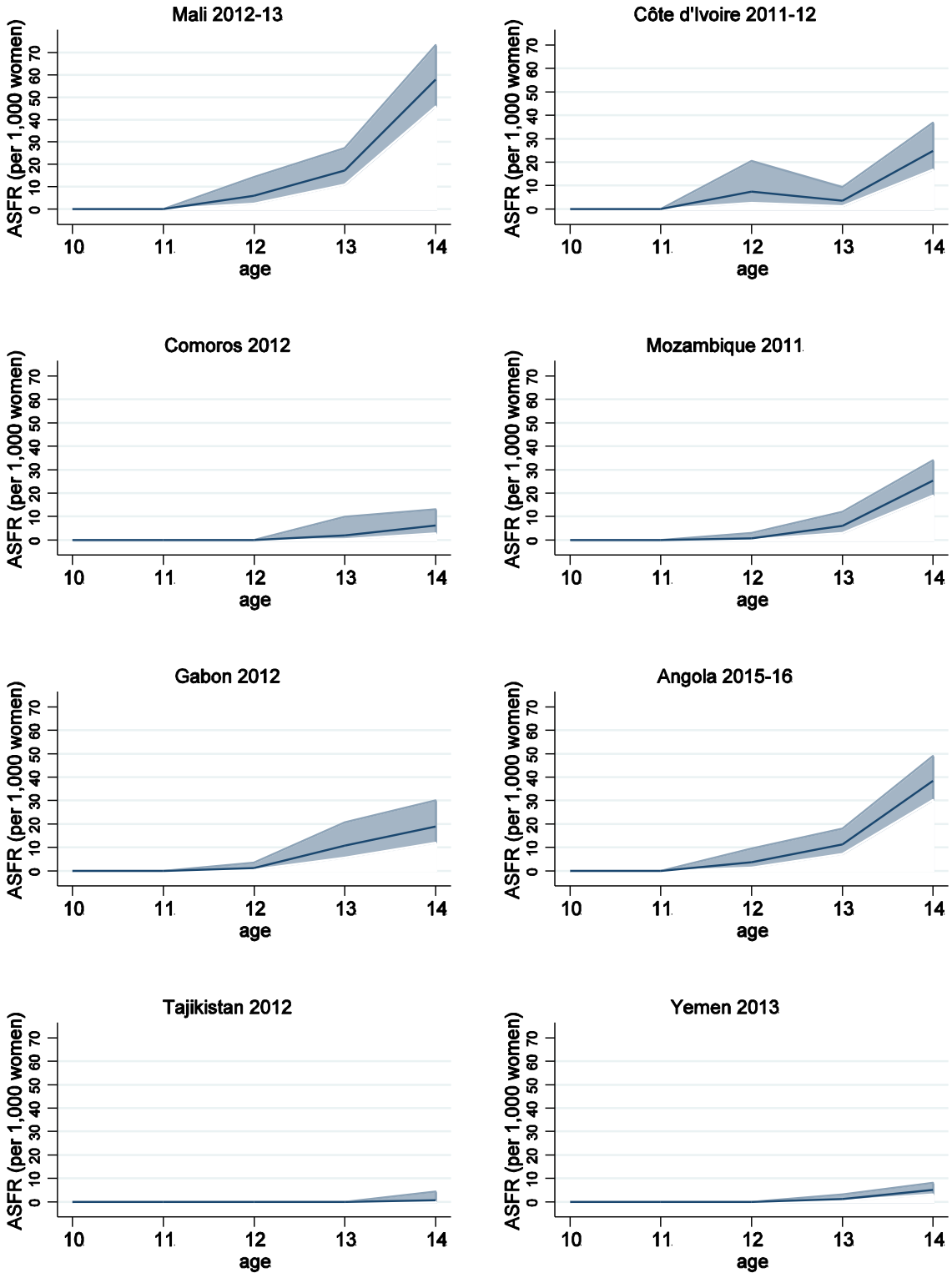
Fig 6. Adolescent fertility curves, selected countries—*continued*



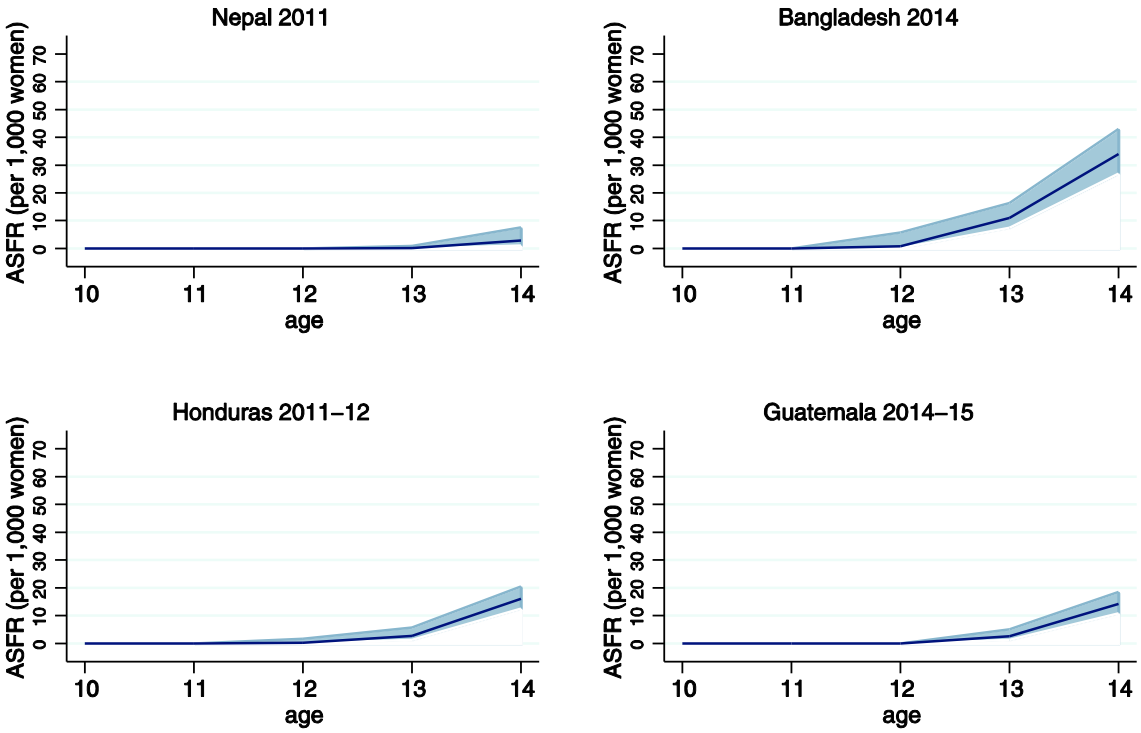
Note:
Selected two countries in each region with the highest and lowest adolescent fertility rates, respectively

Fig 7 Adolescent fertility curves age 10-14 by region for the two surveys in each region with the earliest fertility start



Continued…

Fig 7. Adolescent fertility curves age 10-14 by region for the two surveys in each region with the earliest fertility start—*continued*



Note:
Selected two countries in each region with the highest earliest starting fertility rates assessed at ages 12 and 14

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