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# Early Marriage, Women Empowerment and Child Mortality: Married Too Young To Be a «Good Mother»?

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# EARLY MARRIAGE, WOMEN EMPOWERMENT AND CHILD MORTALITY: MARRIED TOO YOUNG TO BE A «GOOD MOTHER»?<sup>1</sup>

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## **Abstract**

This paper uses data from recent Senegalese Demographic and Health Surveys to explore the link between female empowerment and child mortality via early marriage, defined as marriage before age 16. There exist three channels through which early marriage reduces a mother's ability to take good care of her children: the harmful physical consequences of early sex and pregnancy; a disrupted education; and reduced autonomy and bargaining power. Controlling for the first two of these allows us to isolate the empowerment effect of early marriage. We estimate that it increases the probability that the mother experience at least one son death by 4.43%, and raises the number of dead sons per mother by 0.074. Particular attention is paid to discuss and address endogeneity issues. We also further investigate the heterogeneity of impact by current age and marriage duration. Findings suggest that we effectively identify the empowerment channel.

**Key words:** Early marriage, Senegal, Fertility, Child Mortality, Women Empowerment, Bargaining Power.

## **Résumé**

Cet article utilise les données des Enquêtes Démographiques et de Santé collectées en 2005 et en 2010 au Sénégal pour explorer le lien entre autonomisation des femmes et mortalité infantile, via la pratique du mariage précoce. Le mariage précoce est défini comme tout mariage ayant lieu avant que la jeune fille ait atteint 16 ans. Cette pratique est encore très répandue au Sénégal où 34,4% des femmes mariées sont concernées. Il existe trois canaux via lesquels le mariage précoce réduit l'aptitude des femmes à prendre bien soin de leurs enfants. Le premier est lié aux conséquences physiques désastreuses des rapports sexuels et grossesses précoces. Le deuxième découle du manque d'éducation formelle et informelle reçue par ces jeunes femmes pour lesquelles toute opportunité d'aller à l'école est interrompue précocement par le mariage. Le troisième ressort de l'absence de pouvoir de négociation des femmes au sein de leur ménage et de leur absence d'autonomie. En contrôlant pour les deux premiers canaux, nous sommes en mesure d'isoler l'impact spécifique du canal d'autonomisation des femmes sur la mortalité infantile. On estime alors que cette absence de pouvoir de négociation des femmes, exacerbée dans le cas des mariages précoces, accroît la probabilité d'une femme de voir un de ses fils décédés avant l'âge de 5 ans de 4,43% et leur nombre de 0,074. L'impact sur la mortalité des filles est non significatif. Une attention particulière a été portée à discuter et résoudre les problèmes d'endogénéité auxquels nous faisons face dans cette étude. Nous avons aussi creusé l'hétérogénéité de l'impact en fonction de l'âge actuel de la femme et du nombre d'années passées dans l'union, ceci afin de confirmer que l'on identifie bien le canal d'autonomisation des femmes. En effet, avec le temps, la connaissance du ménage d'accueil et un âge plus élevé qui confère un certain statut social, il est probable que l'effet « pouvoir de négociation » du mariage précoce s'amenuise. C'est effectivement ce que l'on observe.

**Mots Clés :** Mariage précoce, Sénégal, fécondité, mortalité infantile, autonomisation des femmes, pouvoir de négociation.

**JEL Code:** J12, J13, I14.

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# 1 Introduction

Despite being one of the Millennium Development Goals' top priorities, childhood mortality remains a major public-health problem in the developing world, and especially in Sub-Saharan Africa (SSA): this region accounts for 40% of global child mortality,<sup>1</sup> and over the 1990-2000 period experienced the smallest fall in the child-mortality rate of any region, of under 3%.

In some developing countries, reducing fertility is a condition for lower child mortality (Palloni, 1990, and Rosero-Bixby, 1997). In classic demographic transition theory the phenomena of lower mortality and fertility are very much interlinked, with lower mortality yielding subsequent lower fertility (Casterline, 2010). High fertility tends to increase child mortality mainly through maternal depletion and shorter birth intervals which enhance the competition for household resources and maternal care among siblings (Palloni and Rafalimanana, 1999). Age at first union is a key determinant of female reproductive life length and fertility levels (Coale and Treadway, 1986, and Rosero-Bixby, 1996). Harwood-Lejeune (2000) use Demographic and Health Survey (DHS) data from nine Southern and Eastern African countries to estimate that the rising age at marriage explains from one-sixth to one-third of the regional fall in fertility.

In traditional societies lacking widespread knowledge of contraception,<sup>2</sup> the birth-control decision cannot really be separated from that to "engage in coition" (Becker, 1960) and hence to marry. In some developing countries, like Senegal, marriage is still a very powerful, almost universal, institution. Local marriage characteristics are deeply conditioned by social norms and expectations about the roles of spouses and parents. Once married, girls are under a great deal of pressure to become pregnant and prove their worth within their new household (UNFPA, 2005). On average in the developing world, first birth occurs from 14 to 26 months after marriage.<sup>3</sup> Timaeus and Moultrie (2008) show that the South African fall in fertility decline has substantially resulted from a later age at first birth. Kirdar et al. (2011) estimate the effect of compulsory schooling laws on teenage marriage and births in Turkey, and showed that greater education allows marriage to be postponed, and later first births are driven only by this later marriage. Marriage is still the dominant normative framework in which to have a family, and empirical evidence has shown that age at first union and age at first child cannot be dissociated, especially in a context of low contraceptive prevalence. While it is very difficult to legislate for age at first birth, the government can modify the legal framework regulating age at marriage.

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<sup>1</sup>Here the expression "child mortality" refers to children who die between birth and their fifth birthday.

<sup>2</sup>Contraceptive prevalence in Senegal was 12% over 2006-2010 (DHS data).

<sup>3</sup>Except in the case of very young brides, as in Bangladesh. This figure comes from the Unicef report based on 2001 DHS data.

As highlighted by Malhotra (1997), age at first marriage is worthy of investigation, not only because it entails the beginning of reproductive life, but also because the way marriage is set up reflects family functioning and conditions the gender relationships in a society. The countries that continue to experience high child-mortality rates are also those with high fertility rates and younger ages at marriage. In our work here, *early marriage* refers to any form of marriage taking place before the child is 16. Early marriage is an ancestral practice that was first established in order to maximise the number of pregnancies and ensure enough surviving offspring to satisfy household requirements for labour (Marthur et al., 2003). Although this practice has globally declined over recent decades, it is still widespread in some developing countries, particularly in poorer rural areas (Singh and Samara, 1996).

In most of the developing world marriage signals the beginning of reproductive life, hence early marriage is associated with early childbearing and higher fertility, both of which are detrimental to child survival. Early marriage also considerably limits female schooling opportunities; girls are taken out of school in order to dedicate their time to domestic, marital and maternal duties. Undertaking such responsibilities while not yet an adult can be traumatizing, especially in the context of virilocal residence.<sup>4</sup> These girls are characterized by little decision-making power in the household and a greater likelihood of suffering domestic violence (Jensen and Thornton, 2003). The aim of this paper is thus to investigate the role that early marriage plays in the persistence of the unacceptably high levels of child mortality observed in SSA.

Using two rounds of recent Senegalese DHS data, we first attempt to measure the relation between early marriage and child mortality that would result from eradication. We then exploit the characteristics of early-married women to isolate the particular effect of mother’s low bargaining power. Finally, we carry out a number of robustness checks: we first consider the role of mother’s health at time of birth, and then address endogeneity issues by adding household fixed effects and controlling for sibling characteristics and survival status.

The remainder of the paper is organized as follows. Section 2 presents the context of the study, and Section 3 sets out the channels via which early marriage influences child mortality. Section 4 presents the data and some summary statistics. Section 5 discusses our empirical strategy and Section 6 shows the results. Section 7 assesses the robustness of our results, and Section 8 investigates heterogeneity. Finally, Section 9 concludes.

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<sup>4</sup>Virilocal residence refers to unions where the brides leave their own household to join that of their husband. This custom is prevalent in Senegal.

## 2 Context

Child mortality rates in SSA range from 143 of births in Niger to 57% of births in South Africa.<sup>5</sup> In Senegal, 75 children every 1000 births die before they reach their fifth birthday. The UN's Millennium Development Goal was to reduce the number of such deaths to 20 for every 1 000 live births by 2015, which is currently far from the case. Senegal has high fertility rates, with on average 4.8 children per woman, halfway between the figures for Niger (7.1) and South Africa (2.5). A negative correlation between age at first union and lifetime number of births is one of the most common relationships found in the research literature (Bongaarts, 1982). The median age at first union for women aged 25-49 in Niger is strikingly low at 15.5, which is not particularly different from that in older cohorts. In Senegal, the median age at first union is 18.3, ranging from 17.3 for the older cohorts to 19.2 for the younger cohorts of marrying age (20-25 years old).

International conventions<sup>6</sup> define marriage as "*a formalised, binding relationship between consenting adults, i.e. individuals aged at least 18 of full maturity and capacity to act, with legal and/or social standing, in which sexual relations are legitimised and as an arena for reproduction and child rearing which has state recognition*". In Senegal, marriage is officially regulated by the *Code de la Famille*. Article 111 of these regulations specifies that marriage can only be contracted between a man aged at least 18 and a woman aged at least 16. However, exceptions can be made when "extraordinary circumstances" pertain, thus giving early marriage some legitimacy. In Senegal, it is customary to marry only religiously and not civilly, thereby freeing individuals from any legal constraints about which they are likely not concerned. Over 80% of Senegalese marriages are contracted under religious law only.<sup>7</sup>

Even though international conventions strongly recommend setting the minimum age for marriage at 18, we here focus on women who marry before age 16. The proportion of such women remains high in Senegal even though the practice has been banned under civil law since 1972. Our focus on very early female marriage thus better reflects the Senegalese reality. Existing evidence also suggests that, even under greatly-improved living conditions, the outcomes of women who give birth before age 16 remain poorer, while this is not the case for later childbearing (Kramer, 1987; Singh and Wulf, 1990). Even if legal enforcement seems difficult, public policy may therefore target this potentially

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<sup>5</sup>These are UNICEF statistics for 2010.

<sup>6</sup>Among which the main are: The Universal Declaration of Human Rights, the UN Convention on the Elimination of All Forms of Discrimination against Women (CEDAW), the Inter-African Committee on Traditional Practices Affecting the Health of Women and Children (IAC), the 1989 Convention on the Rights of the Child, and the 1990 African Charter on the Rights and Welfare of the Child.

<sup>7</sup>Our own calculations from the nationally-representative *Pauvreté et Structure Familiale* (PSF) survey carried out in 2006-2007.

vulnerable population. Our aim here is to shed light on the harmful effects of early marriage on women's ability to take good care of their children.

Although early marriage sometimes involves boys, we here focus on girls. The bride price practice, common in Senegal, requires the man to have accumulated enough wealth to take care of his future household and pay a bride price when marrying. Men thus marry at later ages than do women, generating a regular spousal age gap. For a number of reasons young women are at a premium on this marriage market, and those who can afford them are older men. While providing lower dowries, early-married girls usually marry men with relatively higher status (Field and Ambrus, 2008).

### 3 Channels of impact

As the early-married are supposed to live in a secure social environment, i.e. marriage, the consequences of early marriage as such on the wife's and children's outcomes have arguably attracted relatively little attention, as opposed to those of unmarried or adolescent mothers. However, teenage marriage can be traumatizing for the girls involved and sharply limit their empowerment and opportunities. Marriage concretizes the onset of adulthood and requires the brides to undertake spousal and parental responsibilities, which can be hard for teenage brides who are physically and psychologically not necessarily sufficiently mature for such a life change. Moreover, as respect is given to elders and men in traditional societies such as Senegal, young brides are at the bottom of the household hierarchy and "at a confluence of social vulnerabilities" (Haberland et al., 2003).

We consider three main channels via which early wedding may affect child mortality. The first is due to the non-respect of the body's maturation process and the physical and health damage associated with early childbearing; the second refers to the lack of formal and informal education received by young brides; and the last concerns their psychological vulnerability and lower bargaining power.

The physical consequences of early childbearing can be life-threatening for both mother and child. Worldwide, maternal mortality is the most prevalent cause of death among women aged 15 to 19 (The State of the World's Children, 2011). Women aged respectively under 20 and 15 face a risk of dying in childbirth which is two and five times higher than that of women over 20 (WHO, 2008) and when they survive childbirth a considerable proportion of them suffer from severe pregnancy or childbirth complications.<sup>8</sup> Early motherhood is also associated with poor maternal health outcomes that subsequently feed through to child health. As well as maternal death, early childbearing also

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<sup>8</sup>These complications include obstetric fistula, preeclampsia, hemorrhage and pelvic inflammatory diseases (Jejeebhoy and Rao, 1995).

increases the risk of neonatal death and stillbirth, premature birth, low birth-weight and child (and infant) morbidity and mortality (ICWR, 2007). Exploiting international data, Donaldson and Billy (1984) find that the offspring of younger women had consistently lower birth-weights. As noted above, early age at first birth is also usually an indicator of greater future fertility. Dixon-Mueller (1993) considers the relationship between women's relative position in the couple and fertility, and finds that women who marry before age 19 have from two to four times more children than those who marry after the age of 25.

The second channel works via education. Once married, schooling or educational opportunities are limited for young brides as they are expected to devote all of their time to the care of their new home and family (Jensen and Thornton, 2003). Field and Ambrus (2008) note that, in Bangladesh, *"each additional year marriage is delayed is associated with 0.3 additional years of schooling and 6.5% higher probability of literacy"*. They also found that delaying marriage significantly increases the use of preventive health-care services. A large body of research has considered the link between female education and the likelihood of child survival (Caldwell and McDonald 1982; Chen and Li 2009; Cleland and Ginneken 1988; Gokhale et al. 2004; Hobcraft 1993; Rowe et al. 2005; LeVine et al. 2012). Educated women have better knowledge of child care, family planning and public infrastructures; they are also more self-confident and self-assertive (Kaufmann and Cleland, 1994). These characteristics enhance their decision-making power and increase their potential earnings, allowing them to enjoy higher status within the household and couple, and take better care of their children and themselves.

Finally, in Senegal most marriages are arranged by parents, and the practice of early marriage is particularly intertwined with that of forced marriage (Gaspart 2007).<sup>9</sup> The trauma undergone by girls pushed prematurely into marriage is exacerbated by the fact that they are undergoing physical and psychological changes, and are prone to instability and risk of poverty (UNICEF 2011). Men and their mothers are usually willing to marry young brides to take advantage of their inexperience and incapacity to confront others, especially older people, in order to shape them the way they want (UNICEF 2001). Teenage girls *"have difficulty in developing their own identity and less confidence in voicing their opinions"* (UNICEF 2001). These phenomena are compounded by large spousal age gaps (Jensen and Thornton 2003) and the custom of virilocal residence, both of which are common in early marriages. Carmichael (2011) notes that a large spousal age gap characterizes relationships in which the younger partner has less power and say in decisions, hence exacerbating the lack of agency and self-confidence from which young brides suffer. In Senegal, the median age at first marriage is respectively 28.1 and 18.5 for men and women. Once married, girls no longer have daily contact with

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<sup>9</sup>Even when the bride's consent is reported, this usually reflects a lack of alternatives or a fear of reprisals.

their original household and, market obligations aside, suffer from limited social mobility and have little access to modern media and the outside world. Jensen and Thornton (2003) report that young brides are also more likely to suffer from domestic violence. Being reclusive and vulnerable, such women are inclined to depression, low self-esteem and physical and emotional distress (Brickell and Chant 2010). They are kept ignorant, socially isolated, and away from family support; they have few future perspectives and little access to economic opportunities. Women's economic dependency is the cornerstone of the perpetuation of early marriage.

Young brides are thus characterized by restricted autonomy, low bargaining power and a greater probability of mental depression,<sup>10</sup> all three of which are associated with child mortality and child care abilities. Our objective here is to assess the role that the low female empowerment associated with early marriage plays in explaining the persistence of high child mortality. Education implies both knowledge and being better able to defend one's position; educated women usually enjoy greater bargaining power. We will be careful in interpreting our results and consider the lower bargaining from early marriage which is net of that associated with low education.

A growing literature has considered the effect of mother's bargaining power on child survival, health and nutrition (Kishor 2000; Linnemayr et al. 2008; Smith et al. 2003; Beegle et al. 2001). On average, men often report larger ideal family sizes and a lower demand for contraception than do their wives (Becker, 1999). Thus, when women obtain more autonomy, translated into greater relative bargaining power, we see lower fertility rates (Balk 1994; Eswaran 2002) and an increase in the use of contraception (Ashraf et al. 2010). Ashraf et al. estimate that female autonomy in decision-making is associated with a 57% fall in unwanted births.

It has also been shown that mothers dedicate a larger share of their budget to children's health (Eswaran 2002) and nutrition (Dancer and Rammohan 2009; Shroff et al. 2009) than do fathers. In India, Maitra (2004) found that more female control over household resources significantly reduces the risk of child mortality via an increase in the demand for prenatal care and a higher probability of hospital delivery. Thomas (1990) uses Brazilian data to show that the likelihood of a child's survival was 20% higher when income was attributed to the mother rather than the father. More recent work has confirmed that female autonomy, defined as a combination of relative decision-making power and access to resources within the household, reduces under-five child mortality (Fantahun et al. 2007; Hossain et al. 2007). Kabeta (2010) found that the probability of child mortality is higher when maternal depression is accompanied by physical and emotional violence.

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<sup>10</sup>Kabeta reports that *"major depression is often associated with a disturbed family environment (Duggan et al. 1998) or exposure to traumatic events or major adversities (Keane and Wolfe 1990; Wolf et al. 2002). It is also associated with marital difficulties (Whisman et al. 2000), recent stressful life events and problems which in most cases women from developing countries are exposed to (Kendler and al. 2003; Kessler 1997)"*.



## 4 Data and summary statistics

### 4.1 Data

The data we analyze here comes from the two last waves of the Demographic and Health Survey (2005 and 2010) collected in Senegal. DHS data are designed to be nationally representative, and contain very rich information on the education, demographic and health of women over their reproductive life. The full sample consists of 30 290 women aged 15 to 49, including 19 344 ever-married women who became mothers before the age of 30. Pregnancies for the over 30s are more risky than those for women aged from 20 to 29. Moreover, a first pregnancy at age 30 or more is uncommon in Senegal,<sup>11</sup> so we decided to exclude such women from our sample. The percentage of women interviewed in 2005 and 2010 is 48% and 52%.

We do not observe women aged under 15, and so miss very young girls who are already married at the time of the survey. As the first years of early unions are the most critical in terms of vulnerability, our results will tend to underestimate the size of any impact. To have an idea of the selection involved here, Table 1 shows the percentage of girls married before 15 by age cohort and for cohorts aged at least 20.<sup>12</sup> These figures are relatively high, so that the underestimation bias is not to be neglected. Among married women, those married before age 15 account for over 16% of the population, and 55% of early-married women. They represent less than 15% of the total female population and exhibit a clear downward trend over time.

Our data obviously also do not cover women who died either during childbearing, childbirth, child rearing or even beforehand. We thus include in our sample the more robust women which will add to the underestimation bias noted above.

Figures 1, 2 and 3 depict the distributions of age, age at first marriage, and age at first child death in the sample. The sample limitation to ever-married women who have given birth at least once in their life severely reduces the number of young women in the sample. Age at first marriage is concentrated between 10 and 25 years old and 99% of married women married before age 30. The most common age for marriage is 15, reflecting current prevalence in Senegal. Age at first child death ranges from 9 to 48, but is concentrated at around 20. Figure 4 sheds light on the age at first child death distribution by plotting the mean age at first child death by age, age at first marriage<sup>13</sup> and age at first birth. All three lines slope upwards. Younger first marriages or births are associated with younger ages at first child death. The relationship is less linear for age at first marriage than

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<sup>11</sup>Fewer than 2% of mothers had their first child at age 30 or more.

<sup>12</sup>Median age at marriage is 18.3 for women, so age at marriage is censored for cohorts aged under 20.

<sup>13</sup>Considering the age at first marriage distribution in Figure 2, we decided to censor age at first marriage at 30 to avoid outliers.

for that at first birth.

Figure 4 shows that women from older age cohorts experience their first child death at later ages than do younger women. Even if progress towards child-mortality reduction has been muted, there has been some and younger women face less risky environments than did older women. The positive slope probably shows that in older cohorts we only observed the more robust women who survive until a certain age. These more robust women tend to experience their first child death at later ages than do more vulnerable women, producing a positive slope.

The number of children who died before age 5 per woman is particularly high for women who married very early, and falls with age at marriage, but rises again for women married after age 30. Figure 6 highlights the negative relationship between age at first child death and the number of children dead before 5; the younger a woman experienced her first child death, the more deaths she will experience later.

## **4.2 Descriptive Statistics - Early-married women**

Table 2 presents some key characteristics of women according to first marriage before or after age 16. Our sample is composed of women who have given birth at least once in their life, independently of the child being alive at the time of interview. We first note the considerable proportion of early-married women, over one-third of the sample, reflecting the extent and persistence of the early-marriage tradition in Senegal. The descriptive statistics are in line with previous work (Jensen and Thornton 2003) in that young brides come from poorer and mainly rural households, experience much higher fertility and child mortality rates, are less educated, have less power and are more prone to accept violence than women who marry as adults. Female genital circumcision and school enrolment rates show that young brides come from more traditional families than women who marry later. Fulani is the predominant ethnic group involved in early marriage. A t-test confirms that the spousal age gap is significantly higher in early unions, even though the grooms there are significantly younger than those in unions contracted between adults. If their young age at marriage generally yields them first-wife status, the early married are also significantly more involved in polygynous unions than are women who marry later. Young brides are also more likely to have been divorced. Young brides have less decision-making power and are less able to refuse sex. Last, they are more likely to suffer violence and consider it as "normal", reflecting social conditioning and domination.

## **4.3 Descriptive Statistics - Child mortality**

Analogously to poverty incidence and depth, we here investigate two dimensions of child mortality and the relationship between them: 1) the likelihood that a woman experience at least one child

death; and 2) the average number of dead children per woman.

The age distribution of child mortality is influenced by the causes of death. For example, infant mortality comes more from congenital anomalies, birth complications or infections at birth, whereas under-five deaths are mainly due to lack of immunization and/or malnutrition (Mahy, 2003). To better understand the implications of early marriage on child mortality, we consider a number of different definitions of the latter:

1. *Under-five mortality*: deaths occurring before the child reaches age five;
2. *Infant mortality*: deaths occurring before the child reaches age one;
3. *Neonatal mortality*: deaths occurring before the child reaches age one month.

Table 3 shows the childhood mortality patterns per woman according to early marriage. The proportion of early-married women affected by child mortality is striking: 40% suffer at least one under-five child death, 30% infant death and 18% neonatal death. Mother's age at birth strongly affects child survival during the first month of life: children born to mothers under 20 are 45% more likely to die in the first month of life than are infants born to mothers aged 20-29 (Mahy, 2003). The average number of dead children per woman is also significantly higher for early-married women, with a larger gap when we focus on under-five mortality.

We also note that the average number of deaths per woman is consistently higher for sons than daughters, regardless of the mother's early marriage. For genetic reasons, boys' survival during the first six months of life is lower than that of girls, due to their greater susceptibility to infectious diseases (Mahy, 2003). The dead daughters to dead sons ratio rises from neonatal to under-five mortality, confirming that the gender gap in child mortality is mainly driven by that at the beginning of life.

## 5 Econometric specification

### 5.1 The global effect of early marriage

We first attempt to estimate the overall effect of early marriage on child mortality by jointly considering all of the potential channels of impact. Using a sample of ever-married women who gave birth at least once before age 30, we estimate the following equation:

$$Y_{ihr} = \alpha + \beta.X_{ih} + \gamma.EarlyWedding_i + \delta_r + \varepsilon_{ihr} \quad (1)$$

Here the dependent variable  $Y_{ihr}$  is either a death dummy for woman  $i$  in household  $h$  in region  $r$  experiencing at least one child death, or the number of dead children of woman  $i$ . Let  $EarlyWedding_i$

be a dummy for woman  $i$  marrying before age 16. The vector  $X_{ih}$  includes individual- and household-level control variables. These cover female  $i$  socioeconomic characteristics like age, age-squared, and dummies for ethnic group, religion<sup>14</sup> and contraceptive use; they also include information about union characteristics like the number of other wives (which increases competition for the household's resources and changes their distribution), whether woman  $i$  lives with her partner or not (affecting access to resources and spending autonomy), whether woman  $i$  has been divorced (which would affect her social status and might have been motivated by a child-death event), the number of unions which woman  $i$  has contracted, and the length of the union, which reflects the duration of woman  $i$ 's active reproductive period.

The household characteristics include dummies for household wealth,<sup>15</sup> time-distance to the closest source of drinking water,<sup>16</sup> and rural or urban location. We add three measures of household composition: the number of women, number of under five children and total number of individuals, as each affects in different ways the household's resources and organization.

The prevalence of early marriage is not the same over Senegalese regions, as shown in Figure 7. We thus add  $\delta_r$  to our model to capture regional fixed effects.

The time-varying characteristics are unfortunately not contemporaneous to the child-death events. However, if their movements are not linked to early marriage or child mortality then their inclusion will not introduce endogeneity. We carry out t-tests to check whether polygamy, as a consequence of child mortality<sup>17</sup> occurs more frequently among early- or later-married women. Descriptive statistics show that globally young brides are found significantly more in polygynous unions. However this does not seem to reflect child-death events, as we find a smaller and less significant difference in the sub-sample of women who experienced at least one under-five child death than in the total sample.<sup>18</sup>

Since the time, resources and behaviours with which a mother provides her child are likely to differ by child sex, and as mortality patterns differ by gender, we estimate equation (1) and those below separately for sons and daughters. All of the estimations are weighted using the DHS sampling weights.

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<sup>14</sup>In DHS Senegal, information on religious affiliation is limited to Muslim (96.4%) or Christian (3.6%).

<sup>15</sup>We use the wealth index calculated by DHS, which is a five-point categorical variable ranging from being among the poorest to being among the richest. We use the middle category as the omitted category here.

<sup>16</sup>This is coded into five dummies: on the premises, from 0 to 15 minutes, from 16 to 30 minutes, from 31 to 60 minutes and more than 60 minutes. On premises is the omitted category.

<sup>17</sup>Child(ren)-mortality events, particularly if they are recurrent, or fecundity issues in a couple, can motivate a man to take another wife in order to ensure "enough" descendants.

<sup>18</sup>The results are not shown here.

## 5.2 The specific effect of early marriage

We now focus more specifically on the effects early marriage has on child mortality through female empowerment, as a combination of bargaining power, autonomy and well-being. To carry out this analysis, we need to identify separately the two other channels (physical and educational) via which early marriage influences child mortality. We estimate both child death and the number of dead children, including a wide set of control variables which we add stepwise. We thus add a number of new variables to  $X_{ih}$  in equation (1) and define three new specifications, as below.

1. We first want to identify the physical early-marriage effects on child mortality. Including age at first birth should capture the risks associated with early childbearing. The total number of children is censored for younger women. However, for each child except the first-born, we have information on the preceding birth interval, i.e the difference in months between the current and the previous birth. Average birth interval is negatively correlated with the total number of children born per woman. For each woman, we calculate the average birth interval as the mean of all preceding birth intervals. To fully capture the indirect consequences of early childbearing, i.e. greater fertility that increases competition among siblings and exacerbates maternal depletion, especially when pregnancies occur at frequent intervals, we thus decide to complete our specification with a control for average birth interval to pick up close pregnancy and fertility effects on child mortality (Bhalotra and van Soest, 2007).

Female health indicators are mostly missing in our data. Including these would thus drastically reduce our sample, so we do not do so. However, we do carry out robustness checks in Section 7 to see how accounting for current health changes our findings.

2. Second, we would like to account for mother's education, as this is a key determinant of child survival and depends on age at marriage. Education is measured by six dummies for no education, completed or some primary, completed or some secondary, and entered higher education.

3. Last, to see whether our results reflect the age gap between the spouses, we control for this latter. We also include controls for woman  $i$ 's partner's education, defined in the same way as above.

## 6 Results

### 6.1 Global effect

Table 4 shows the results from probit estimation of the global effect of early marriage. The dependent variable is under-five mortality in columns 1 to 3, infant mortality in columns 4 to 6, and neonatal mortality in columns 7 to 9. Equation (1) is estimated for all children in columns 1, 4 and 7, for

sons only in columns 2, 5 and 8, and for daughters only in columns 3, 6 and 9. The table shows the marginal effects, with their standard errors in parentheses.

Table 4 suggests that reducing early marriage would significantly improve all three types of child mortality. As expected, the effect is larger for under-five than for infant or neonatal mortality. Not marrying early lowers the probability that married women experience under-five mortality by 6.7%, infant mortality by 3.8% and neonatal mortality by 2.5%.<sup>19</sup> The results remain significant for neonatal mortality, but at lower levels: 5% for daughters and 10% for sons. We should also bear in mind that, as is common in many developing countries (and particularly in Africa, where education is relatively low), our data will suffer from reporting bias. Child mortality is reported by mothers, rather than coming from any statistical "census". In a context of high fertility individuals may overlook some dead children, especially when they died very young. We consequently expect neonatal mortality to suffer from more under-declaration bias than the other child mortality indicators, especially that for the under-fives. We also expect neonatal deaths to be more associated with maternal mortality than deaths of older children.

Splitting the estimations by gender, we find a greater effect of early marriage on son than on daughter mortality. This differential gender impact rises as the child-mortality measure includes older children. Women who do not marry early have lower probabilities of experiencing daughter neonatal and under-five mortality of respectively 1.43% and 2.88%, with analogous figures for sons of 1.61% and 6%.

Table 5 shows the results from OLS estimation of the number of dead children per woman, and is organized in the same way as in Table 4. Early marriage is again associated with higher child mortality, with 0.15 more under-five dead children per married woman (which is over one fifth of current child mortality - see Table 3). As in Table 4, the consequences of early marriage for the number of dead children per woman are greater for sons than for daughters. The previous figure of 0.15 dead children is composed of 0.088 dead sons and 0.061 dead daughters. This is a higher relative movement for sons than for daughters even though mortality rates are higher for sons. Male children are more vulnerable than female children during the first six months of life, which explains the large neonatal gender gap and its propagation to infant and under-five mortality.

The above results show the global effect of early marriage on child mortality. In order to assess the bargaining power effect of early marriage, we now attempt to factor out the physical and education effects of early marriage.

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<sup>19</sup>The child mortality definitions here work like Russian dolls, with under-five mortality including infant mortality, which itself encompasses neonatal mortality.

## 6.2 Specific impact

Tables 6, 8 and 10 present the results from probit estimation of the effect of early marriage on the likelihood of under-five, infant and neonatal mortality respectively. Columns 1 to 3 refer to all births, columns 1b to 3b to sons, and columns 1g to 3g to daughters. The estimations in the columns starting with numbers 1, 2 and 3 correspond to the same-numbered specifications in Section 5.2. The tables show marginal effects with standard errors in parentheses. Tables 7, 9 and 11 then refer to analogous OLS results for the number of child deaths at different ages.

**Under-five mortality** The estimations here attempt to control for some of the channels via which early marriage affects child mortality. We specifically control for age at first birth and the physical determinants of child mortality via average birth intervals, as described above. As both of these are significant determinants of child mortality, and are correlated with early marriage, we expect the coefficients on early marriage to fall. This is indeed what happens in Table 6. Early marriage is now estimated to increase the likelihood of child death by 4.8%, as opposed to 6.7% in Table 4. For daughters, controlling for the physical consequences of early marriage entirely explains the latter's impact. In the overall and son estimations, early marriage continues to have a significant effect which is of similar size in both estimations. Among ever-married women who gave birth before age 30, early marriage increases the likelihood of son mortality by 4.47%.

Specification 2 enlarges the set of control variables to include education. The coefficients on these (not reported) are very significant, as expected from the existing literature. The early marriage coefficients are somewhat lower, but no different from those in specification 1.

Finally, specification 3 adds some socio-demographic characteristics of woman  $i$ 's partner, such as his education and the spousal age gap, to check that we are not confounding early marriage bargaining power with a large spousal age gap. The coefficients on the spousal age gap are negative, but are not significant.

The coefficients on early marriage are very similar across all specifications. Early marriage increases the risk of under-five child death by 4.64% and under-five son death by 4.43%. It does not significantly affect the probability of daughter death. Early married women are thus significantly more likely to experience son death. It might be thought that, as sex discrimination is common in Senegal, the care gap between daughters of early- and later-married women may only be relatively small. On the contrary, this gap will be larger for sons, who likely suffer more from their mother's reduced ability to take care of them.

Table 7 shows that early marriage significantly increases the number of dead children per woman. Controlling for age at first birth and average birth intervals significantly reduces the early-

marriage coefficients, which however remain very significant, including for daughter mortality.

The early marriage coefficients are not significantly different from one specification to the other across gender. While early marriage significantly increases the probability of son mortality only, it does significantly increase the number of both dead sons and daughters per woman. However, the effect is much larger (over twice as high) and is more statistically significant for the number of sons compared to daughters. Overall, early marriage has a significant detrimental impact on child mortality, especially for sons. Early marriage increases the number of dead sons per woman by 0.07, and the number of dead daughters by 0.03.

**Infant mortality** Table 8 reveals a significant impact of early marriage on the likelihood of experiencing at least one infant child death. Here, as for under-five mortality, the relationship does not hold for daughter mortality. The coefficients on early marriage are smaller and less significant than those for under-five mortality. We here estimate that early marriage increases the probability of experiencing at least one son death by 2.23%.

In Table 9, all of the coefficients on early marriage are significant, with a larger effect on sons than on daughters. Early marriage raises the number of infant deaths per woman by 0.065, consisting of 0.041 sons and 0.024 daughters.

The infant mortality results are in line with those on under-five mortality. That we find no impact of early marriage on daughter death may well reflect discrimination against girls, yielding a generalized prevalence of daughter mortality over all household types. However, as noted in Section 4.3, we use two indicators covering different dimensions of child mortality. While the first reveals no impact of early marriage on the likelihood of experiencing at least one daughter death, the second does uncover some impact on the number of dead daughters born to the early married. This latter indicator reflects the intensity of mortality, and shows that this rises with early marriage whatever the child's gender.

**Neonatal mortality** The pattern of findings in Table 10 is different to that previous tables: we here find no impact of early marriage on son mortality likelihood. We know that boys are more vulnerable during the first six months of life than girls (Mahy, 2003), which may explain why we find no significant differences in the likelihood of son neonatal mortality between the early- and later-married. The natural discrimination against boys in early life may limit the possibility of any additional early-marriage effect. In addition, as early marriage usually goes hand-in-hand with lower age at first birth, which in turn is associated with both maternal and neonatal mortality, the death in childbirth of young mothers will reduce the number of observed surviving mothers who experienced neonatal death.



Table 11 shows a significant effect of early marriage on the numbers of both son and daughter neonatal deaths at respectively the 5% and 10% levels. Early marriage raises the number of son deaths per woman by 0.033 with an analogous figure for daughters of 0.016.

## 7 Endogeneity issues and robustness checks

We above saw a large and robust negative effect of early marriage on under-five son survival, controlling for a wide set of socio-economic and individual marital characteristics, as well as household variables. However, we cannot exclude the possibility of some remaining endogeneity problems. The rest of the paper will focus on under-five son mortality, for which we found the most consistent and significant early marriage effect. In this section we will set out the three types of endogeneity bias we face, and propose a number of robustness checks.

### 7.1 Endogeneity issues

As noted in Subsection 4.1, our analysis may suffer from endogeneity issues relating to selection, of which we identify three types below.

1. *Selection of the origin household*

Early-married girls come from households that either did not have enough resources to take care of their daughter(s) for longer or which were less interested in girls' welfare and thus invested less in them than in boys. In both cases, there are endogeneity issues, as these origin households might exhibit unobserved economic and/or cultural components which explain both early marriage and the quality of child care. Having been raised in households where girls may not have been a priority could lead early-married women to reproduce these behaviours and take less good care of themselves and their children (UNFPA 2002). Early-married girls grew up in households that probably share similar habits regarding household administration, resource allocation or members' education which could further affect child mortality. Certain behaviours associated with child mortality which are commonly observed among early-married women, could originate from the replication of some origin household practices rather than from early marriage itself.

2. *Selection of the host household*

As we consider a sample of ever-married women, they are likely to be in the household that they joined after marrying, i.e. the household where their husband used to live. These households involved in early marriage may well share common behaviours and beliefs regarding women's

role in society,<sup>20</sup> negatively affecting both mother and child well being. Households "acquiring" very young brides may seek to benefit from their domestic, marital and maternal tasks. We expect all women in these households to be exploited, independently of their age at marriage. We thus want to differentiate any early-marriage effect from host-household specific characteristics which would feed through to child mortality whatever the mother's age at marriage. In this case, we would expect daughters to be at the greatest disadvantage.

→ Both household-level selection biases imply the overestimation of the impact of early marriage on child mortality. The negative coefficients identified so far could be driven, at least partially, by these household fixed effects rather than reflecting early marriage per se.

### 3. *Selection of women*

As noted in Section 4.1, only those women who survive until the date of the survey will be present in our data. The early-married are commonly found in more risky and poorer environments than women who marry later: we thus expect the selection bias to be stronger for the former than the latter. The early-married women present in our data will then be more robust than the later-married women. If these characteristics are also associated with child survival, the selection bias will induce endogeneity leading to an underestimation of the true impact of early marriage on child mortality. This underestimation might particularly affect the number of dead children per woman as this outcome mechanically rises over time, and more so than the simple probability of experiencing any child death.

We now carry out a number of robustness checks to ensure that we do not confound early marriage with the above-mentioned selection effects.

## 7.2 **Women selection → Height as a health indicator**

There is a close link between fertility and morbidity levels, on the one hand, and mother's nutritional status on the other (Mahy, 2003). Mother's health is a crucial determinant of child development and survival. Our analysis to date potentially suffers from omitted-variable bias as we do not control for mother's health during pregnancy and birth. Adult height is a widely-used health indicator, "*determined by genetic potential and by net nutrition, the balance between food intake and the demands on it, including the demands of disease, most importantly during early childhood*" (Deaton, 2007). This has the advantage of being time-invariant, unlike indicators based on weight such as the Body Mass Index. Moreover, height reflects the living conditions experienced during childhood and can account for the endogeneity bias associated with the selection of more-robust women.

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<sup>20</sup>These types of behaviours and beliefs were discussed in Section 3, regarding the empowerment channel.

In the DHS, maternal anthropometric data are collected only for women who gave birth in the five years preceding the survey date, which covers 78.4% of the ever-married and ever-mothers sample. However, all age categories are represented in this sub-sample. There is a 35.3% rate of missing values for height, leaving us with 5 074 usable observations on mother’s height after the inclusion of other control variables, i.e. three times fewer than in the baseline sample. Attrition may produce selection bias in our estimations if it is correlated with our variables of interest. We thus investigate height attrition by carrying out a number of t-tests on key characteristics, as reported in Table 12. The results reveal little evidence of potential endogeneity in height attrition regarding child mortality, early marriage and our main socioeconomic indicators.

Specification 3 compares the estimation for regressions with and without the height (*Height*) variable, estimated on the same reduced sample (*Height sample*) and those previously obtained in the baseline sample (*Baseline*).

Table 13 shows the results from the probit estimation of the likelihood of under-five mortality. For both genders, the coefficients on early marriage in the Height sample do not change when we control for height, as confirmed by a coefficient-equality test. In the height sample, the coefficients on early marriage are insignificant for all children and sons, and are surprisingly negatively significant for daughters at the 10% level. This change from the previous results is *a priori* due to the selection involved in the new sample. The results show that the different early-marriage coefficients come about due to the different samples rather than from adding height as a control variable. Our decision not to control for height therefore avoids using a non-representative sample of Senegalese married women. It is of interest to note that height is significantly correlated with daughters’ mortality but not sons’, suggesting that daughters are more vulnerable to their mother’s health than are boys.

Table 14 presents the results from the OLS estimation of the intensity of under-five mortality. Here again, the marriage coefficients in the height sample do not depend on our controlling for height. There is a significant effect of early marriage on the number of dead sons per woman. Controlling for height in this specific sample of women, we estimate that early marriage increases the number of dead sons by 0.07.

We thus conclude that controlling for height does not alter our results, so that our previous findings probably did not suffer from this kind of omitted-variable bias. We continue to find a significant effect of early marriage on under-five son mortality.

### 7.3 Host household selection → Household fixed-effects

Our estimations suffer from a potential host-household fixed effect associated with poorer child care for all women in the host household. We expect these unobserved components to be cultural, as we

have already included household economic characteristics in our previous estimations.

We introduce household fixed effects (HFE) to remove *host household* endogeneity in the estimation of specification 3 for under-five mortality:

$$Y_{ih} = \alpha + \beta.X_i + \gamma.EarlyWedding_i + \theta_h + \varepsilon_{ih} \quad (2)$$

Here  $\theta_h$  are the household fixed effects. These pick up any time-invariant household characteristics; we can still however identify an early-marriage effect by comparing two or more women within the same household. We use the same vector  $X_i$  of individual controls as in specification 3, with the addition of relationship to household head dummies. The wife's status in the household, and thus her access to resources and decisions, is mainly determined by her relationship to the household head. We create relationship-type categories, ensuring that there are a minimum number of observations per category: 1 = woman  $i$  is the household head; 2 = woman  $i$  is the household head's wife; 3 = the household head is from woman  $i$ 's family;<sup>21</sup> 4 = the household head is from woman  $i$ 's husband's family;<sup>22</sup> 5 = the household head is another kind of relative; and 6 = the household head is not related to the respondent. The results from conditional logit estimation appear in Table 15, and those from OLS fixed-effect estimation in Table 16.

Including household fixed effects sharply reduces the sample compared to the baseline estimations. Even so, the conditional-logit estimation shows a significant and very large impact (28.8%) of early marriage on the probability of experiencing under-five son death. No particular effect is found on the number of dead children per woman. Among ever-married women living in the same household, early marriage significantly predicts the probability of son death but not the number of dead children per woman, suggesting that child mortality intensity depends more on host-household characteristics.

We also pay attention to the type of household in which women live. Household structure in Senegal is a complex and diverse institution. Ever-married women may be divorced at the time of interview and live in either their original household or a wide variety of other household types. Women may not have yet moved into their marital home, or may live in their own household as their husband lives with another wife or is a migrant. However, for our fixed effects to capture *host household* endogeneity we consider households in which the early-married woman lives.

We consequently identify two types of virilocal households, based on woman  $i$ 's relationship to the household head. We distinguish between households where women  $i$  is the head's wife (this is the most numerous group, at 43.5% of the sample) referred to as *husband's household*, and other virilocal

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<sup>21</sup>Household head is the father/mother or the son/daughter or the grandfather/mother or the brother/sister.

<sup>22</sup>Household head is the father/mother-in-law, the son/daughter-in-law or the co-spouse.

households where woman  $i$  is either the daughter-in-law, mother-in-law or co-spouse of the household head, referred to as *virilocal household*. For each estimation, we limit the sample to women who share the same relationship to the household head. This means that within the husband’s household, we will compare co-wives’ outcomes, and for other virilocal households we will compare the outcomes of women with marginal links<sup>23</sup> to the household head. We thus substitute the relationship to household head dummies by wife-rank dummies in the *husband’s household* FE specification, as all women have the same relationship to the household head. The difference in status is here captured by the wife’s rank. Living in a household headed by one’s husband can have two effects: this could either allow better access to resources and support when facing difficulties, or it could exacerbate the pressure on woman  $i$  to satisfy her husband and his family’s wishes. The results appear in Tables 15 and 16. The key estimated coefficients are insignificant, except for the number of dead children per woman among co-wives living in their husband’s household.

We extend our robustness tests by further examining early marriage according to household type. HFE are arguably not the best way of investigating this problem as the samples vary so much from one household type to another. We therefore go back to specification 3, and add dummy variables for household type, as well as their interactions with early marriage.

We enlarge the household categories to cover the whole sample and introduce three new categories: households headed by the woman  $i$  herself (*Head*), households headed by women  $i$ ’s close relatives (*own family household*) and households headed by women  $i$ ’s other kind of relatives and non-relatives (*Other*). The *own family household* category serves as the reference category. The results from probit and OLS estimation of under-five mortality appear in Table 17.

The negative effect of early marriage continues to be found for son mortality, with even larger coefficients than those in Tables 5 and 6. Being the household head’s wife has a globally positive impact on daughter mortality compared to being the household head’s daughter. Surprisingly, early-married women who are back (or still) living in their own family household fare worse regarding son mortality than do their counterparts in all other household types.

#### 7.4 Origin household selection → Women sibship survival status

In DHS data there is very little information on past events and living conditions of interviewed individuals which would help counter the endogeneity resulting from *origin household selection*. We thus propose to exploit information on woman  $i$ ’s siblings, including their number, gender and survival up to age five<sup>24</sup> These sibling variables capture information on wealth, gender discrimination, mother’s

<sup>23</sup>Either daughter-in-law, mother-in-law or co-spouse of the household head.

<sup>24</sup>Other survival ages were tested: 10, 15 and 20. Similar results pertained.

fertility rate, sibship composition, and childhood mortality in woman  $i$ 's own family. They therefore help to control for *origin household* endogeneity bias.

However, these variables are censored for the youngest women in our sample, as not all of their brothers and sisters will have been born yet. Female reproductive life lasts for around 25 years, so we may not observe the total number of siblings for women aged under 25. We thus carry out this robustness check on the whole sample and those aged at least 25.

We add the total number of brothers and sisters and the number of brothers and sisters who died before age 5 to specification 3. The results are shown in Tables 18 and 19. We first note the similarity of the estimated early-marriage coefficients between these and the previous specifications. The results for women aged at least 25 are very similar to those in the full sample, suggesting that any censoring regarding these additional variables affects neither the size nor the significance of the early-marriage coefficients.

The numbers of dead siblings does not affect son mortality probability or prevalence, but does affect daughter mortality. It could be that, whatever difficulties and conditions that were experienced during childhood, having a boy is a privilege and confers status on the woman who aims to provide her sons with the best care possible. On the other hand, women seem to replicate more their origin household with respect to girls, as the number of dead sisters before age 5 significantly affects the woman's probability of having at least one dead daughter before age 5 and increases the number of dead daughters before age 5.

We thus confirm the robustness of our findings to origin household endogeneity, both regarding the size and significance of the early-marriage coefficient.

## 8 Effect heterogeneity and testing the empowerment channel

This paper has considered the effect of female empowerment, as reflected in early marriage, on child death. A number of checks have revealed a robust positive impact of early marriage on son mortality.

We would like to be sure that this effect does indeed reflect female empowerment. Women's bargaining power and autonomy are at their lowest when brides are very young, i.e. during the first years of marriage. In the first years, girls are traumatized by the change in their environment and feel lonely as they have not adapted to their new family or responsibilities. They will progressively become accustomed to their new life and conditions, and get to know their new household. Teenagers do not have the audacity to contradict older people as they are at the bottom of the hierarchy. As they grow older and get to know their husband and family better, they will become more confident, and will better know the household rules and how to deal with them. With time and age, women accede to higher status within their household, via maternity and the death of older family members.

We thus expect the empowerment of young brides to be lowest at the beginning of marriage and to rise progressively over time.

We thus propose two new specifications testing the heterogeneity of the early-marriage effect by bride's age (or the length of marriage) and identifying the bargaining power channel through early marriage. We limit these specifications to the probability of death.

We only have information on the length of the most recent union, so for divorced women do not know how long they stayed in the earlier unions nor up to what age. We thus consider both the full sample of ever-married ever-mothers and a sample of women in their first union. The results appear in Tables 20 and 21.

We first see that the early-marriage effect on child death falls with current age and length of union. Early marriage no longer significantly affects child mortality once the woman reaches age 40 and/or 25 years of marriage. Separating by current age or length of union reveals a significant early-marriage effect on daughter mortality, which was previously obscured. This effect on daughter mortality is of shorter duration than that on son mortality, but is larger in size during the first years of marriage. During the very first years of marriage (0-4), the probability of son death is actually not statistically significant.

The effects are similar in the full and first-union samples. That an early-marriage effect, decreasing with women's age, be found for women who are still in their first union (and thus still married to the same man with the same family-in-law) suggests that this works via female empowerment.

## 9 Conclusion

The crucial role of women in poverty transmission suggests considerable returns to female empowerment and autonomy. Early marriage is a secular practice which encourages the feminization and subsequent intergenerational transmission of poverty. The health, mental and social consequences of early marriage have serious effects on the women concerned and their children.

This paper explored the link between early marriage and child mortality. Early marriage is estimated to increase the probability that a mother experience child death by 6.7% and the number of dead children per mother by 0.15. We focus particularly on the empowerment channel associated with early marriage and estimate that this raises the likelihood the the mother experience son mortality by 4.43% and the number of dead sons per woman by 0.074. We provide robust evidence that early marriage increases son mortality after controlling for a wide set of individual and household characteristics. This effect is consistently significant for son under-five mortality, and is robust to a number of different tests.

While our results may not at first seem to fit in with the generally-observed discrimination

against women, we believe that they in fact probably are. Early-married women are more likely to experience son mortality and have more dead sons than those who marry later. This is consistent with Eswaran (2002), who finds that greater female autonomy in the household may worsen daughters' survival outcomes.

The gap in child care for early- vs. later-married mothers is wider for sons, who are typically more favored in the household. Early-married women are less able to take good care of all their children. Even when we control for the likely replication of child care behavior from their original household, we find a significant effect of early marriage on son mortality and the number of dead daughters per woman.

An investigation of heterogeneity by age and length of union confirms the negative consequences of early marriage on son mortality, and on daughter mortality in the first years of marriage. The effect of early marriage falls in size as women grow older and/or with marriage duration. These results are consistent with our suggestion that early marriage, through female empowerment, negatively affects child mortality.



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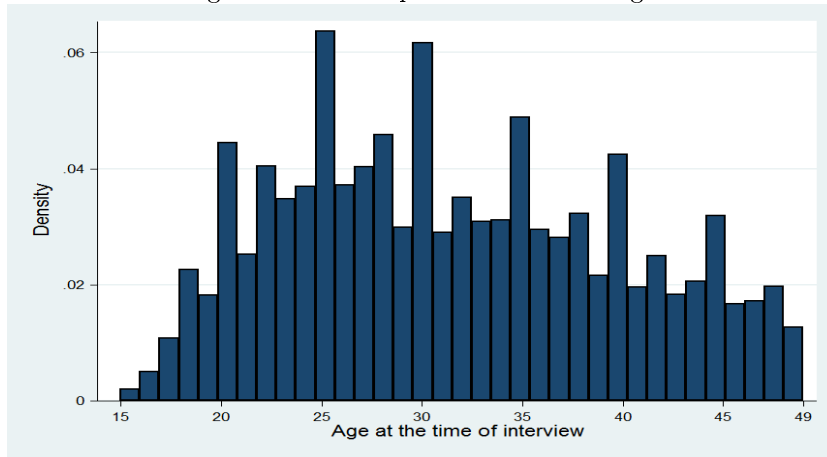
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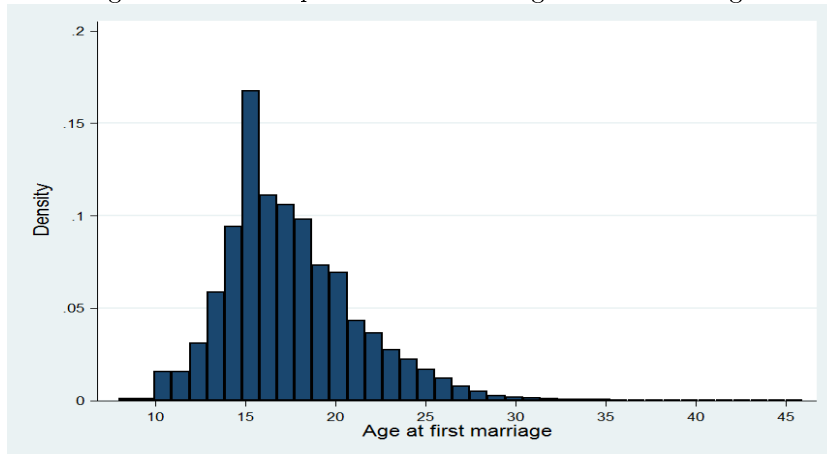
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Figure 1: The sample distribution of age



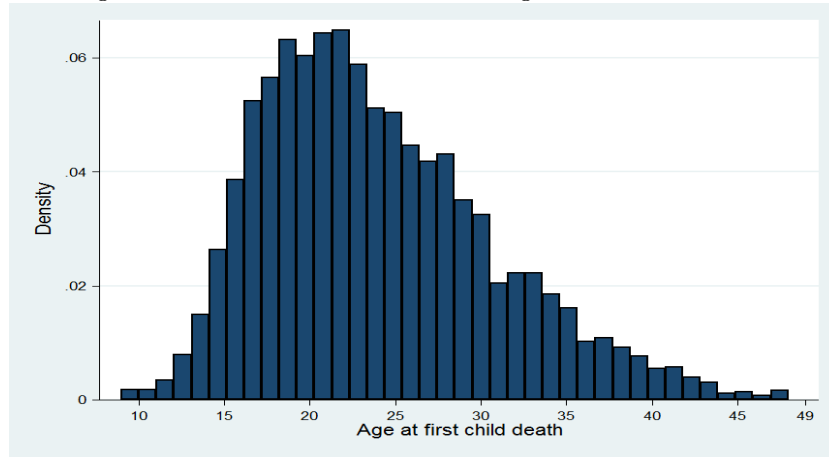
Source: DHS 2005-2010. The sample is of ever-married women who gave birth at least once before age 30.

Figure 2: The sample distribution of age at first marriage



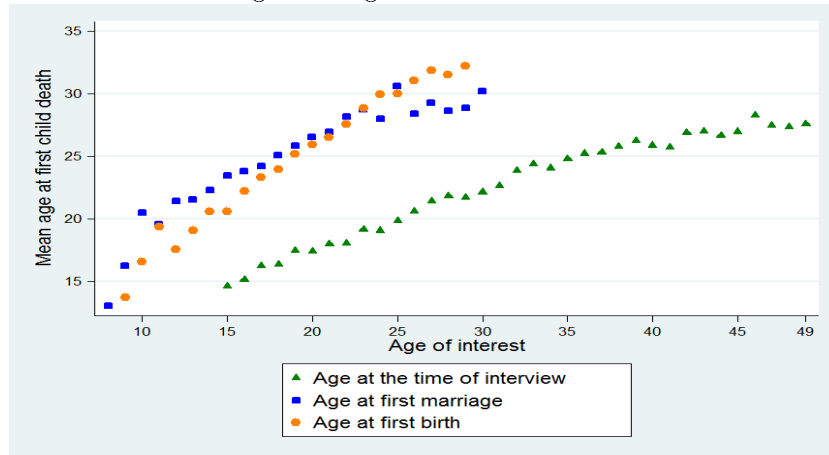
Source: DHS 2005-2010. The sample is of ever-married women who gave birth at least once before age 30.

Figure 3: The sample distribution of age at first child death



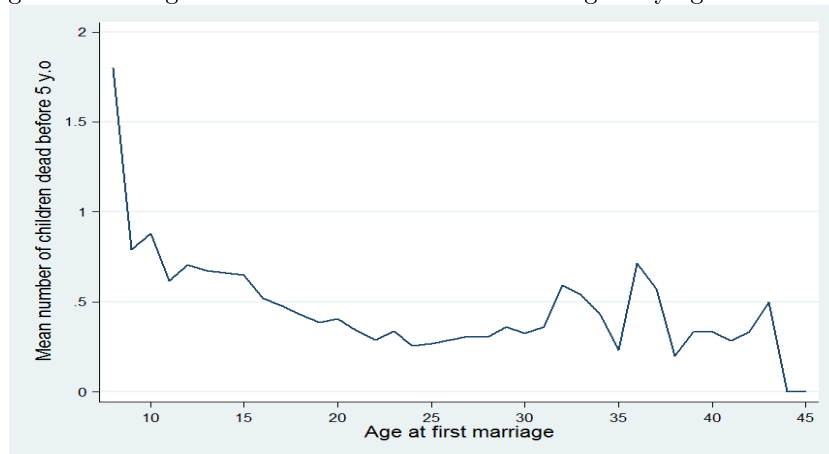
Source: DHS 2005-2010. The sample is of ever-married women who gave birth at least once before age 30.

Figure 4: Age at first child death



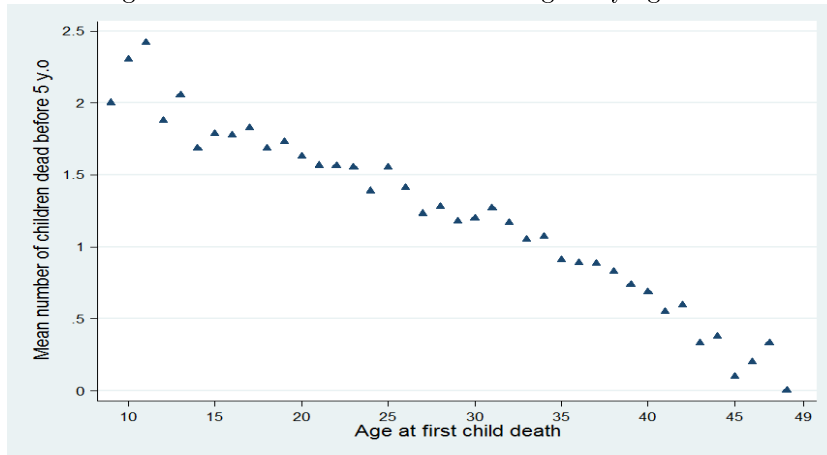
Source: DHS 2005-2010. The sample is of ever-married women who gave birth at least once before age 30.

Figure 5: Average number of children dead before age 5 by age at marriage



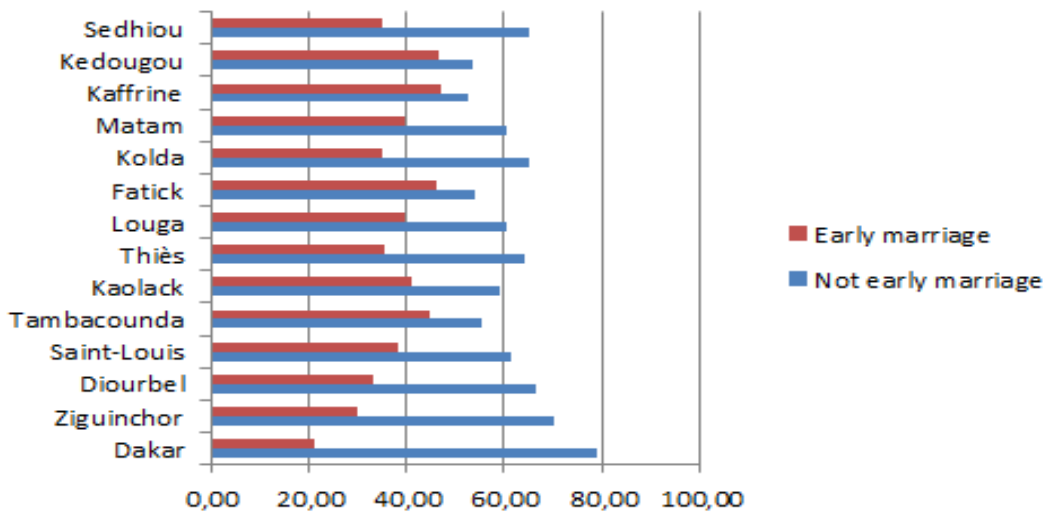
Source: DHS 2005-2010. The sample is of ever-married women who gave birth at least once before age 30.

Figure 6: Average number of children dead before age 5 by age at first child death



Source: DHS 2005-2010. The sample is of ever-married women who gave birth at least once before age 30.

Figure 7: Percentage of early married women by region



Source: DHS 2005-2010. The sample is of ever-married women who gave birth at least once before age 30.



Table 1: Proportion of women married before age 15 by cohort

	Married before 15 among married women		Married before 15 among all women		Married before 15 among early-married women	
	%	Total N	%	Total N	%	Total N
Cohort 20-24	16.8	3 935	10.90	6 063	55.87	1 405
Cohort 25-29	16	4 323	13.47	5 124	55.81	1 376
Cohort 30-34	15.7	3 794	14.51	4 101	56.43	1 189
Cohort 35-39	16.4	3 301	15.77	3 429	55.21	1 094
Cohort 40-44	19.7	2 563	19.18	2 627	55.59	957
Cohort 45-49	18.47	1 924	18.15	1 958	51.77	734
<b>Total</b>	<b>16.87</b>	<b>19 840</b>	<b>14.36</b>	<b>23 302</b>	<b>55.37</b>	<b>6 755</b>

Source: 2005 and 2010 DHS surveys. The sample is of women aged 20-49. The statistics are weighted.

Table 2: Ever-married mothers' characteristics by early marriage

	Married before 16 (1)	Married after 16 (2)	Mean test diff. (p-value) (1)-(2)
<b>Individual characteristics</b>			
Main ethnic group	Fula (37.8%)	Wolof (39.6%)	0.00
Second ethnic group	Wolof (33.4%)	Fula (23.7%)	0.00
Mean age at first birth	16.5	20.6	0.00
Average number of children born per woman	4.8	3.8	0.00
Average number of children still alive per woman	4	3.3	0.00
Average birth intervals (in months)	36.5	37.5	0.00
No education	85.1%	63.7%	0.00
Circumcised	41.7%	27.6%	0.00
<b>Union characteristics</b>			
Husband mean age at union	28.8	32.1	0.00
Mean spousal age gap	14.6	12.2	0.00
Engaged in polygynous union	48.1%	40.8%	0.00
First wife rank	48.3%	38.2%	0.00
Lives with husband	72.5%	66.7%	0.00
Husband not educated	79.6%	61.7%	0.00
Has been divorced	25.5%	21.2%	0.00
<b>Empowerment</b>			
Can refuse to have sex with partner	26.5%	29.3%	0.00
Not involved in decisions about own health care	74.7%	71.9%	0.00
Not at all involved in decision-making	28%	22.6%	0.00
Considers being beaten as justified <sup>(a)</sup>	24.3%	16%	0.00
<b>Observations</b>	<b>6 397</b> (34.4%)	<b>12 211</b> (65.6%)	
<b>Household characteristics<sup>(b)</sup></b>			
Belongs to poorest quintile	30%	15.8%	0.00
Lives in a rural area	71.4%	51.3%	0.00
<b>Observations</b>	<b>5 625</b> (40%)	<b>8 518</b> (60%)	

Source: 2005 and 2010 DHS surveys. The sample is of ever-married mothers i.e. women who gave birth to at least one child, independently of child survival. The statistics are weighted.

<sup>(a)</sup> The woman considers it normal to be beaten in at least one of the five following situations: going out without asking permission, neglecting the children, arguing with husband, refusing to have sex and burning food.

<sup>(b)</sup> The statistics for the household characteristics are weighted at the individual level. The number and percentage of household observations are not weighted.

Table 3: Descriptive statistics for child mortality per woman - Sample of ever-married mothers

	Married before 16 (1)	Married after 16 (2)	Mean test diff. (p-value) (1)-(2)
<b>Child Mortality &lt; 5</b>			
% of women with at least one child dead	40	25	0.00
% of women with at least one son dead	26.8	15.8	0.00
% of women with at least one daughter dead	23.1	13.6	0.00
Average number of dead children per woman	0.68	0.37	0.00
Average number of dead sons per woman	0.37	0.2	0.00
Average number of dead daughters per woman	0.31	0.17	0.00
<b>Observations</b>	<b>6 397</b>	<b>12 211</b>	
<b>Child Mortality &lt; 1</b>			
% of women with at least one child dead	29.8	19	0.00
% of women with at least one son dead	19.2	11.8	0.00
% of women with at least one daughter dead	15.7	9.6	0.00
Average number of dead children per woman	0.44	0.25	0.00
Average number of dead sons per woman	0.25	0.14	0.00
Average number of dead daughters per woman	0.19	0.11	0.00
<b>Observations</b>	<b>6 397</b>	<b>12 211</b>	
<b>Child Mortality &lt; 1 month</b>			
% of women with at least one child dead	18.2	11.6	0.00
% of women with at least one son dead	11.8	7.5	0.00
% of women with at least one daughter dead	8.7	5.2	0.00
Average number of dead children per woman	0.25	0.14	0.00
Average number of dead sons per woman	0.15	0.09	0.00
Average number of dead daughters per woman	0.1	0.06	0.00
<b>Observations</b>	<b>6 397</b>	<b>12 211</b>	

Source: 2005 and 2010 DHS surveys. The statistics are weighted.

Table 4: The global impact of early marriage on the likelihood of child death - Marginal effects.

	<5 years			<1 year			<1 month		
	All (1)	Sons (2)	Daughters (3)	All (4)	Sons (5)	Daughters (6)	All (7)	Sons (8)	Daughters (9)
<b>Union characteristics</b>									
Early marriage	0.0673*** (0.0139)	0.0597*** (0.0120)	0.0288*** (0.0106)	0.0375*** (0.0123)	0.0331*** (0.0103)	0.0160* (0.00909)	0.0247** (0.0102)	0.0161* (0.00828)	0.0143** (0.00692)
No. co-wives	0.0185*** (0.00702)	0.0138** (0.00579)	0.0126** (0.00543)	0.0197*** (0.00625)	0.0128** (0.00503)	0.0116** (0.00467)	0.00862* (0.00498)	0.00788** (0.00395)	0.00325 (0.00348)
Divorced	0.00227 (0.0137)	-0.00225 (0.0112)	-0.00447 (0.0103)	0.00335 (0.0121)	0.000119 (0.00961)	-0.00321 (0.00894)	0.0123 (0.0102)	0.00924 (0.00815)	0.00470 (0.00709)
Lives with partner	-0.0544*** (0.0120)	-0.0381*** (0.0104)	-0.0334*** (0.00938)	-0.0306*** (0.0107)	-0.0208** (0.00885)	-0.0175** (0.00803)	-0.0209** (0.00881)	-0.0147** (0.00722)	-0.0121** (0.00616)
Length of union	0.0543*** (0.00838)	0.0281*** (0.00703)	0.0394*** (0.00653)	0.0360*** (0.00750)	0.0159*** (0.00609)	0.0266*** (0.00569)	0.0165*** (0.00619)	0.00844* (0.00497)	0.0101** (0.00432)
<b>Individual characteristics</b>									
Age	0.0139** (0.00564)	0.00913* (0.00483)	0.0137*** (0.00427)	0.00531 (0.00497)	0.00338 (0.00413)	0.00476 (0.00363)	-0.00201 (0.00406)	-0.00258 (0.00334)	-2.96e-05 (0.00266)
Age-squared	-0.000145* (8.02e-05)	-6.19e-05 (6.75e-05)	-0.000171*** (6.08e-05)	-4.31e-05 (7.01e-05)	-2.51e-06 (5.76e-05)	-6.31e-05 (5.10e-05)	6.17e-05 (5.74e-05)	6.97e-05 (4.69e-05)	8.63e-06 (3.80e-05)
Contraception	-0.0122 (0.0121)	-0.00809 (0.0102)	-0.00719 (0.00931)	-0.0142 (0.0108)	-0.00636 (0.00882)	-0.0113 (0.00794)	0.00179 (0.00888)	-0.00170 (0.00713)	0.00129 (0.00611)
Christian	-0.0290 (0.0317)	-0.0230 (0.0269)	-0.0163 (0.0238)	-0.0618** (0.0280)	-0.0425* (0.0229)	-0.0248 (0.0212)	-0.0517** (0.0231)	-0.0215 (0.0184)	-0.0313** (0.0153)
Ethnic group dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>Household characteristics</b>									
Rural	0.0450*** (0.0133)	0.0464*** (0.0112)	0.0146 (0.0104)	0.0348*** (0.0119)	0.0258*** (0.00975)	0.0127 (0.00883)	0.0185* (0.00966)	0.0111 (0.00782)	0.0113* (0.00664)
No. women	0.0145*** (0.00478)	0.00690* (0.00412)	0.0113*** (0.00356)	0.0128*** (0.00416)	0.00710** (0.00343)	0.00584* (0.00308)	0.00508 (0.00334)	0.00120 (0.00272)	0.00370* (0.00221)
No. children	-0.000176 (0.00348)	-0.00148 (0.00295)	-0.00102 (0.00268)	-0.00325 (0.00312)	-0.00321 (0.00258)	-0.00418* (0.00231)	-0.00460* (0.00253)	-0.00331 (0.00205)	-0.00315* (0.00176)
No. members	-0.00483*** (0.00149)	-0.00234* (0.00128)	-0.00316*** (0.00113)	-0.00376*** (0.00130)	-0.00194* (0.00107)	-0.000988 (0.000958)	-0.00137 (0.00105)	-0.000339 (0.000849)	-0.000544 (0.000712)
Wealth dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Distance to drinking water dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>Observations</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>

Robust standard errors are in parentheses; \* p<0.1, \*\* p<0.05, \*\*\* p<0.01. All estimations are weighted.

Table 5: The global impact of early marriage on the number of dead children per woman.

	<5 years			<1 year			<1 month		
	All (1)	Sons (2)	Daughters (3)	All (4)	Sons (5)	Daughters (6)	All (7)	Sons (8)	Daughters (9)
<b>Union characteristics</b>									
Early marriage	0.145*** (0.0258)	0.0975*** (0.0182)	0.0473*** (0.0154)	0.0875*** (0.0220)	0.0555*** (0.0161)	0.0320*** (0.0124)	0.0614*** (0.0173)	0.0410*** (0.0136)	0.0203*** (0.00874)
No. co-wives	0.0509*** (0.0141)	0.0260*** (0.00943)	0.0250*** (0.00916)	0.0392*** (0.0119)	0.0188** (0.00817)	0.0204*** (0.00757)	0.0196** (0.00883)	0.0118* (0.00665)	0.00779 (0.00502)
Lives with partner	-0.0984*** (0.0196)	-0.0592*** (0.0134)	-0.0392*** (0.0120)	-0.0582*** (0.0162)	-0.0389*** (0.0115)	-0.0193** (0.00982)	-0.0369*** (0.0126)	-0.0249*** (0.00944)	-0.0120* (0.00698)
Divorced	-0.0255 (0.0280)	-0.00700 (0.0205)	-0.0185 (0.0162)	-0.0190 (0.0240)	-0.00307 (0.0183)	-0.0159 (0.0127)	0.0128 (0.0210)	0.0128 (0.0166)	3.77e-05 (0.00964)
Length of union	0.0933*** (0.0134)	0.0433*** (0.00994)	0.0500*** (0.00776)	0.0536*** (0.0110)	0.0259*** (0.00835)	0.0276*** (0.00619)	0.0241*** (0.00842)	0.0106 (0.00672)	0.0134*** (0.00445)
<b>Individual characteristics</b>									
Age	0.000833 (0.0108)	-0.00514 (0.00810)	0.00597 (0.00577)	-0.00646 (0.00942)	-0.00778 (0.00737)	0.00132 (0.00464)	-0.0134 (0.00826)	-0.0114* (0.00666)	-0.00206 (0.00349)
Age-squared	0.000243 (0.000173)	0.000236* (0.000131)	6.84e-06 (8.98e-05)	0.000237 (0.000151)	0.000211* (0.000119)	2.65e-05 (7.06e-05)	0.000286** (0.000135)	0.000239** (0.000109)	4.70e-05 (5.36e-05)
Contraception	-0.0236 (0.0208)	-0.0161 (0.0147)	-0.00757 (0.0121)	-0.0199 (0.0178)	-0.00768 (0.0131)	-0.0122 (0.00994)	-0.000383 (0.0146)	-0.000158 (0.0112)	-0.000225 (0.00745)
Christian	-0.0147** (0.00582)	-0.00855** (0.00381)	-0.00618* (0.00331)	-0.0120** (0.00533)	-0.00721** (0.00342)	-0.00478* (0.00275)	-0.00882** (0.00420)	-0.00453* (0.00237)	-0.00429* (0.00239)
Ethnic group dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>Household characteristics</b>									
Rural	0.0969*** (0.0213)	0.0646*** (0.0146)	0.0323** (0.0135)	0.0577*** (0.0176)	0.0373*** (0.0123)	0.0204* (0.0110)	0.0286** (0.0131)	0.0149 (0.00923)	0.0137* (0.00808)
No. women	0.0220*** (0.00769)	0.0118** (0.00576)	0.0102** (0.00449)	0.0140** (0.00648)	0.00951** (0.00475)	0.00449 (0.00383)	0.00553 (0.00465)	0.00313 (0.00362)	0.00240 (0.00261)
No. children	0.00440 (0.00652)	0.00455 (0.00479)	-0.000147 (0.00363)	-0.00423 (0.00566)	0.000403 (0.00421)	-0.00463 (0.00302)	-0.00391 (0.00444)	-7.45e-05 (0.00341)	-0.00384* (0.00217)
No. members	-0.00910*** (0.00271)	-0.00501** (0.00203)	-0.00409*** (0.00148)	-0.00435* (0.00233)	-0.00339** (0.00170)	-0.000959 (0.00127)	-0.00189 (0.00169)	-0.00158 (0.00128)	-0.000319 (0.000888)
Wealth dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Distance to drinking water dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-0.0671 (0.181)	0.0338 (0.136)	-0.101 (0.0948)	0.146 (0.157)	0.156 (0.124)	-0.0104 (0.0761)	0.239* (0.137)	0.203* (0.111)	0.0356 (0.0570)
<b>Observations</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>
R-squared	0.164	0.101	0.105	0.093	0.058	0.055	0.048	0.034	0.025

Robust standard errors are in parentheses; \* p<0.1, \*\* p<0.05, \*\*\* p<0.01. All estimations are weighted.

Table 6: The impact of early marriage on the likelihood of under-five mortality - Probit estimations - marginal effects.

	All			Sons		Daughters		
	(1)	(2)	(3)	(1b)	(2b)	(1g)	(2g)	(3g)
<b>Union characteristics</b>								
Early marriage	0.0483*** (0.0150)	0.0464*** (0.0148)	0.0464*** (0.0147)	0.0447*** (0.0124)	0.0437*** (0.0123)	0.0154 (0.0105)	0.0144 (0.0104)	0.0142 (0.0104)
No. co-wives	0.0141** (0.00704)	0.0131* (0.00709)	0.0139* (0.00733)	0.0107* (0.00574)	0.00992* (0.00573)	0.00938* (0.00526)	0.00911* (0.00524)	0.00908* (0.00535)
Divorced	0.0231 (0.0142)	0.0236 (0.0144)	0.0245* (0.0144)	0.0109 (0.0116)	0.0112 (0.0116)	0.00964 (0.0105)	0.00981 (0.0105)	0.0105 (0.0106)
Lives with partner	-0.0326** (0.0127)	-0.0314** (0.0125)	-0.0339*** (0.0126)	-0.0235** (0.0107)	-0.0224** (0.0106)	-0.0177* (0.00933)	-0.0173* (0.00931)	-0.0176* (0.00932)
Length of union	0.0103 (0.00966)	0.00835 (0.00970)	0.00819 (0.00963)	-0.00327 (0.00796)	-0.00547 (0.00794)	0.0135** (0.00681)	0.0134* (0.00684)	0.0132* (0.00686)
Spousal age gap			-0.000818 (0.000558)			-0.000450 (0.000462)		-0.000338 (0.000425)
Partner educ. attain. dummies	No	No	Yes	No	No	No	No	Yes
<b>Individual characteristics</b>								
Age	0.0421*** (0.00604)	0.0422*** (0.00595)	0.0422*** (0.00595)	0.0278*** (0.00499)	0.0279*** (0.00495)	0.0305*** (0.00432)	0.0305*** (0.00431)	0.0305*** (0.00431)
Age-squared	-0.000388*** (8.24e-05)	-0.000387*** (8.14e-05)	-0.000388*** (8.13e-05)	-0.000218*** (6.71e-05)	-0.000217*** (6.66e-05)	-0.000319*** (5.98e-05)	-0.000319*** (5.91e-05)	-0.000320*** (5.90e-05)
Christian	-0.00892 (0.0198)	-0.00820 (0.0158)	-0.00724 (0.0116)	-0.0124 (0.0289)	-0.0102 (0.0285)	-0.00289 (0.00730)	-0.00423 (0.0119)	-0.00359 (0.00874)
Contraception	-0.0262** (0.0125)	-0.0186 (0.0124)	-0.0165 (0.0125)	-0.0167* (0.0101)	-0.0109 (0.0101)	-0.0153* (0.00892)	-0.0131 (0.00899)	-0.0115 (0.00900)
Age at first birth	-0.0211*** (0.00210)	-0.0208*** (0.00204)	-0.0209*** (0.00203)	-0.0148*** (0.00168)	-0.0144*** (0.00168)	-0.0124*** (0.00141)	-0.0124*** (0.00139)	-0.0124*** (0.00139)
Average birth interval	-0.00635*** (0.000607)	-0.00628*** (0.000595)	-0.00627*** (0.000596)	-0.00434*** (0.000514)	-0.00426*** (0.000512)	-0.00487*** (0.000511)	-0.00489*** (0.000471)	-0.00488*** (0.000470)
Educational attainment dummies	No	Yes	Yes	No	Yes	No	Yes	Yes
Ethnic group dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>Household characteristics</b>								
Rural	0.0433*** (0.0139)	0.0394*** (0.0134)	0.0375*** (0.0134)	0.0444*** (0.0111)	0.0413*** (0.0111)	0.0119 (0.0102)	0.0106 (0.0102)	0.00905 (0.0102)
No. women	0.0192*** (0.00488)	0.0188*** (0.00490)	0.0187*** (0.00490)	0.00978** (0.00414)	0.00938** (0.00411)	0.0138*** (0.00346)	0.0139*** (0.00346)	0.0138*** (0.00346)
No. children	0.00196 (0.00374)	0.00167 (0.00354)	0.00122 (0.00355)	6.02e-05 (0.00295)	-0.000154 (0.00294)	0.000343 (0.00263)	0.000269 (0.00263)	-7.53e-05 (0.00262)
No. members	-0.00702*** (0.00152)	-0.00700*** (0.00152)	-0.00693*** (0.00152)	-0.00373*** (0.00129)	-0.00371*** (0.00128)	-0.00442*** (0.00109)	-0.00443*** (0.00109)	-0.00433*** (0.00109)
Wealth dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Distance to drinking water dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>Observations</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>

Robust standard errors are in parentheses; \* p<0.1, \*\* p<0.05, \*\*\* p<0.01. All estimations are weighted.

Table 7: The impact of early marriage on the number of under-five deaths - OLS estimations.

	All			Sons			Daughters		
	(1)	(2)	(3)	(1b)	(2b)	(3b)	(1g)	(2g)	(3g)
<b>Union characteristics</b>									
Early marriage	0.109*** (0.0254)	0.106*** (0.0254)	0.0690*** (0.0207)	0.0755*** (0.0180)	0.0738*** (0.0180)	0.0742*** (0.0180)	0.0331** (0.0154)	0.0318** (0.0154)	0.0315** (0.0154)
No. co-wives	0.0421*** (0.0137)	0.0407*** (0.0137)	0.0406*** (0.0110)	0.0211** (0.00933)	0.0199** (0.00936)	0.0198** (0.00998)	0.0210** (0.00902)	0.0208** (0.00900)	0.0209** (0.00902)
Divorced	0.00624 (0.0281)	0.00739 (0.0281)	0.00808 (0.0201)	0.00955 (0.0206)	0.0103 (0.0207)	0.0121 (0.0208)	-0.00331 (0.0161)	-0.00291 (0.0161)	-0.00160 (0.0161)
Lives with partner	-0.0468** (0.0196)	-0.0463** (0.0196)	-0.0506*** (0.0177)	-0.0315** (0.0133)	-0.0306** (0.0133)	-0.0326** (0.0134)	-0.0153 (0.0122)	-0.0157 (0.0122)	-0.0161 (0.0124)
Length of union	-0.00800 (0.0159)	-0.00984 (0.0160)	-0.00939 (0.0133)	-0.0143 (0.0119)	-0.0160 (0.0120)	-0.0169 (0.0120)	0.00631 (0.00875)	0.00618 (0.00883)	0.00606 (0.00891)
Spousal age gap			-0.00117 (0.000824)			-0.000766 (0.000776)			-0.000539 (0.000719)
Partner educ. attain. dummies	no	no	Yes	no	no	Yes	no	no	Yes
<b>Individual characteristics</b>									
Age	0.0621*** (0.0106)	0.0623*** (0.0106)	0.0592*** (0.00865)	0.0290*** (0.00778)	0.0291*** (0.00775)	0.0291*** (0.00773)	0.0331*** (0.00621)	0.0332*** (0.00620)	0.0332*** (0.00620)
Age-squared	-0.000278* (0.000165)	-0.000278* (0.000164)	-0.000192 (0.000120)	-5.04e-05 (0.000124)	-4.95e-05 (0.000123)	-4.82e-05 (0.000123)	-0.000227** (9.11e-05)	-0.000228** (9.08e-05)	-0.000230** (9.06e-05)
Christian	-0.0123** (0.00523)	-0.0122** (0.00520)	-0.00922 (0.00658)	-0.00729** (0.00359)	-0.00707** (0.00356)	-0.00696** (0.00351)	-0.00502 (0.00305)	-0.00514* (0.00302)	-0.00504* (0.00299)
Contraception	-0.0474** (0.0208)	-0.0395* (0.0209)	-0.0534*** (0.0183)	-0.0291* (0.0149)	-0.0229 (0.0148)	-0.0189 (0.0149)	-0.0184 (0.0120)	-0.0166 (0.0122)	-0.0139 (0.0123)
Age at first birth	-0.0446*** (0.00364)	-0.0446*** (0.00364)	-0.0490*** (0.00280)	-0.0256*** (0.00271)	-0.0255*** (0.00272)	-0.0255*** (0.00272)	-0.0190*** (0.00208)	-0.0191*** (0.00208)	-0.0192*** (0.00207)
Average birth interval	-0.0108*** (0.000652)	-0.0108*** (0.000648)	-0.0120*** (0.000471)	-0.00574*** (0.000465)	-0.00569*** (0.000466)	-0.00570*** (0.000469)	-0.00508*** (0.000320)	-0.00509*** (0.000313)	-0.00508*** (0.000312)
Educational attainment dummies	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Ethnic group dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>Household characteristics</b>									
Rural	0.0925*** (0.0207)	0.0887*** (0.0208)	0.0725*** (0.0210)	0.0624*** (0.0144)	0.0594*** (0.0145)	0.0563*** (0.0146)	0.0301** (0.0133)	0.0293** (0.0134)	0.0268** (0.0134)
No. women	0.0289*** (0.00770)	0.0289*** (0.00770)	0.0221*** (0.00676)	0.0154*** (0.00582)	0.0153*** (0.00580)	0.0154*** (0.00580)	0.0135*** (0.00446)	0.0137*** (0.00447)	0.0137*** (0.00449)
No. children	0.00857 (0.00648)	0.00853 (0.00648)	0.00769 (0.00535)	0.00708 (0.00480)	0.00700 (0.00480)	0.00641 (0.00476)	0.00150 (0.00362)	0.00153 (0.00363)	0.00117 (0.00362)
No. members	-0.0128*** (0.00269)	-0.0130*** (0.00270)	-0.0108*** (0.00222)	-0.00704*** (0.00205)	-0.00714*** (0.00205)	-0.00710*** (0.00205)	-0.00577*** (0.00147)	-0.00585*** (0.00148)	-0.00583*** (0.00148)
Wealth dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Distance to drinking water dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.0619 (0.179)	0.0765 (0.179)	0.250* (0.150)	0.112 (0.137)	0.123 (0.137)	0.151 (0.142)	-0.0504 (0.0939)	-0.0462 (0.0940)	-0.0275 (0.0962)
<b>Observations</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>
R-squared	0.204	0.205	0.209	0.127	0.128	0.129	0.129	0.129	0.130

Standard errors are in parentheses: \* p<0.1, \*\* p<0.05, \*\*\* p<0.01. All estimations are weighted.

Table 8: The impact of early marriage on the likelihood of infant mortality - Probit estimations - marginal effects

	All			Sons			Daughters		
	(1)	(2)	(3)	(1b)	(2b)	(3b)	(1g)	(2g)	(3g)
<b>Union characteristics</b>									
Early marriage	0.0229*	0.0218*	0.0220*	0.0225**	0.0217**	0.0223**	0.00699	0.00690	0.00680
	(0.0125)	(0.0126)	(0.0125)	(0.0102)	(0.0101)	(0.0101)	(0.00874)	(0.00877)	(0.00875)
No. co-wives	0.0160**	0.0156**	0.0172***	0.0103**	0.00981**	0.0113**	0.00906**	0.00908**	0.00924**
	(0.00623)	(0.00623)	(0.00643)	(0.00493)	(0.00493)	(0.00505)	(0.00445)	(0.00443)	(0.00452)
Divorced	0.0213*	0.0217*	0.0225*	0.00997	0.0103	0.0116	0.00761	0.00756	0.00812
	(0.0126)	(0.0126)	(0.0126)	(0.00990)	(0.00986)	(0.00987)	(0.00897)	(0.00895)	(0.00898)
Lives with partner	-0.0124	-0.0116	-0.0121	-0.00956	-0.00856	-0.00904	-0.00560	-0.00550	-0.00504
	(0.0109)	(0.0109)	(0.0109)	(0.00893)	(0.00887)	(0.00883)	(0.00785)	(0.00784)	(0.00783)
Length of union	0.00277	0.00161	0.00173	-0.00635	-0.00786	-0.00822	0.00902	0.00906	0.00904
	(0.00846)	(0.00852)	(0.00852)	(0.00674)	(0.00669)	(0.00666)	(0.00588)	(0.00598)	(0.00599)
Spousal age gap			-0.000639			-0.000645			-0.000209
			(0.000494)			(0.000412)			(0.000357)
Partner educ. attain. dummies	No	No	Yes	No	No	Yes	No	No	Yes
<b>Individual characteristics</b>									
Age	0.0277***	0.0278***	0.0278***	0.0175***	0.0175***	0.0175***	0.0170***	0.0170***	0.0170***
	(0.00518)	(0.00517)	(0.00517)	(0.00420)	(0.00416)	(0.00414)	(0.00362)	(0.00362)	(0.00361)
Age-squared	-0.000243***	-0.000242***	-0.000244***	-0.000126**	-0.000125**	-0.000125**	-0.000175***	-0.000175***	-0.000176***
	(7.01e-05)	(7.00e-05)	(7.00e-05)	(5.65e-05)	(5.59e-05)	(5.57e-05)	(4.92e-05)	(4.91e-05)	(4.90e-05)
Christian	-0.0455	-0.0437	-0.0440	-0.0349	-0.0335	-0.0330	-0.0120	-0.0130	-0.0123
	(0.0300)	(0.0292)	(0.0290)	(0.0235)	(0.0233)	(0.0234)	(0.0218)	(0.0204)	(0.0203)
Contraception	-0.0256**	-0.0217**	-0.0218**	-0.0130	-0.00885	-0.00923	-0.0166**	-0.0166**	-0.0159**
	(0.0106)	(0.0107)	(0.0107)	(0.00856)	(0.00858)	(0.00859)	(0.00743)	(0.00743)	(0.00739)
Age at first birth	-0.0156***	-0.0154***	-0.0154***	-0.0102***	-0.0100***	-0.0101***	-0.00830***	-0.00832***	-0.00835***
	(0.00172)	(0.00171)	(0.00171)	(0.00136)	(0.00135)	(0.00135)	(0.00120)	(0.00120)	(0.00119)
Average birth interval	-0.00581***	-0.00575***	-0.00576***	-0.00358***	-0.00352***	-0.00353***	-0.00387***	-0.00390***	-0.00390***
	(0.000581)	(0.000568)	(0.000565)	(0.000454)	(0.000452)	(0.000448)	(0.000451)	(0.000406)	(0.000402)
Educational attainment dummies	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Ethnic group dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>Household characteristics</b>									
Rural	0.0317***	0.0296**	0.0289**	0.0233**	0.0210**	0.0205**	0.0103	0.0102	0.00926
	(0.0117)	(0.0118)	(0.0118)	(0.00953)	(0.00951)	(0.00957)	(0.00842)	(0.00847)	(0.00851)
No. women	0.0169***	0.0167***	0.0168***	0.00964***	0.00935***	0.00961***	0.00761***	0.00767***	0.00766***
	(0.00415)	(0.00414)	(0.00415)	(0.00337)	(0.00333)	(0.00333)	(0.00292)	(0.00292)	(0.00293)
No. children	-0.00182	-0.00195	-0.00216	-0.00228	-0.00238	-0.00248	-0.00302	-0.00301	-0.00320
	(0.00313)	(0.00312)	(0.00313)	(0.00256)	(0.00255)	(0.00254)	(0.00222)	(0.00221)	(0.00221)
No. members	-0.00550***	-0.00552***	-0.00549***	-0.00300***	-0.00300***	-0.00306***	-0.00191**	-0.00194**	-0.00188**
	(0.00129)	(0.00129)	(0.00129)	(0.00105)	(0.00105)	(0.00104)	(0.000908)	(0.000908)	(0.000907)
Wealth dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Distance to drinking water dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>Observations</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>

Robust standard errors are in parentheses; \* p<0.1, \*\* p<0.05, \*\*\* p<0.01. All estimations are weighted.



Table 9: The impact of early marriage on the number of infant deaths - OLS estimations.

	All			Sons			Daughters		
	(1)	(2)	(3)	(1b)	(2b)	(3b)	(1g)	(2g)	(3g)
<b>Union characteristics</b>									
Early marriage	0.0664*** (0.0213)	0.0649*** (0.0213)	0.0651*** (0.0213)	0.0421*** (0.0156)	0.0409*** (0.0156)	0.0414*** (0.0155)	0.0244* (0.0124)	0.0240* (0.0125)	0.0237* (0.0125)
No. co-wives	0.0332*** (0.0117)	0.0326*** (0.0117)	0.0338*** (0.0118)	0.0154* (0.00809)	0.0147* (0.00814)	0.0162* (0.00878)	0.0178** (0.00751)	0.0179** (0.00748)	0.0176** (0.00735)
Divorced	0.00389 (0.0242)	0.00407 (0.0242)	0.00679 (0.0246)	0.00918 (0.0185)	0.00935 (0.0185)	0.0114 (0.0188)	-0.00529 (0.0126)	-0.00529 (0.0127)	-0.00460 (0.0127)
Lives with partner	-0.0224 (0.0160)	-0.0215 (0.0160)	-0.0221 (0.0162)	-0.0192* (0.0112)	-0.0182 (0.0112)	-0.0197* (0.0113)	-0.00324 (0.00998)	-0.00335 (0.0101)	-0.00237 (0.0102)
Length of union	-0.0115 (0.0135)	-0.0129 (0.0136)	-0.0135 (0.0137)	-0.0123 (0.0103)	-0.0137 (0.0103)	-0.0141 (0.0103)	0.000777 (0.00733)	0.000719 (0.00745)	0.000654 (0.00751)
Spousal age gap			-0.00114 (0.00107)			-0.00103 (0.000737)			-0.000112 (0.000654)
Partner educ. attain. dummies	No	No	Yes	No	no	Yes	No	No	Yes
<b>Individual characteristics</b>									
Age	0.0341*** (0.00898)	0.0343*** (0.00896)	0.0341*** (0.00895)	0.0155** (0.00691)	0.0156** (0.00688)	0.0154* (0.00686)	0.0187*** (0.00499)	0.0187*** (0.00499)	0.0187*** (0.00499)
Age-squared	-0.000113 (0.000141)	-0.000113 (0.000141)	-0.000113 (0.000141)	1.25e-05 (0.000112)	1.28e-05 (0.000111)	1.38e-05 (0.000111)	-0.000126* (7.13e-05)	-0.000126* (7.13e-05)	-0.000127* (7.11e-05)
Christian	-0.0102** (0.00476)	-0.0101** (0.00471)	-0.0101** (0.00463)	-0.00627** (0.00312)	-0.00610** (0.00307)	-0.00618** (0.00301)	-0.00396 (0.00256)	-0.00399 (0.00255)	-0.00393 (0.00254)
Contraception	-0.0361** (0.0179)	-0.0306* (0.0179)	-0.0266 (0.0179)	-0.0168 (0.0132)	-0.0118 (0.0131)	-0.00936 (0.0131)	-0.0193* (0.00996)	-0.0188* (0.0101)	-0.0173* (0.0100)
Age at first birth	-0.0282*** (0.00315)	-0.0281*** (0.00315)	-0.0282*** (0.00316)	-0.0168*** (0.00239)	-0.0166*** (0.00239)	-0.0167*** (0.00239)	-0.0115*** (0.00176)	-0.0115*** (0.00176)	-0.0116*** (0.00176)
Average birth interval	-0.00762*** (0.000550)	-0.00759*** (0.000546)	-0.00760*** (0.000547)	-0.00415*** (0.000416)	-0.00411*** (0.000416)	-0.00413*** (0.000417)	-0.00347*** (0.000250)	-0.00348*** (0.000244)	-0.00347*** (0.000243)
Educational attainment dummies	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Ethnic group dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>Household characteristics</b>									
Rural	0.0543*** (0.0173)	0.0517*** (0.0173)	0.0481*** (0.0175)	0.0356*** (0.0121)	0.0331*** (0.0122)	0.0308** (0.0124)	0.0187* (0.0108)	0.0186* (0.0109)	0.0173 (0.0109)
No. women	0.0191*** (0.00645)	0.0189*** (0.00644)	0.0192*** (0.00645)	0.0122** (0.00477)	0.0119** (0.00475)	0.0122** (0.00476)	0.00688* (0.00380)	0.00695* (0.00381)	0.00708* (0.00382)
No. children	-0.00180 (0.00566)	-0.00193 (0.00566)	-0.00256 (0.00560)	0.00195 (0.00424)	0.00181 (0.00424)	0.00126 (0.00420)	-0.00375 (0.00303)	-0.00373 (0.00303)	-0.00382 (0.00302)
No. members	-0.00687*** (0.00231)	-0.00692*** (0.00231)	-0.00693*** (0.00232)	-0.00481*** (0.00172)	-0.00481*** (0.00172)	-0.00479*** (0.00171)	-0.00206 (0.00126)	-0.00212* (0.00126)	-0.00214* (0.00127)
Wealth dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Distance to drinking water dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.220 (0.157)	0.226 (0.158)	0.263 (0.166)	0.204 (0.125)	0.209* (0.126)	0.242* (0.132)	0.0165 (0.0759)	0.0165 (0.0763)	0.0211 (0.0793)
<b>Observations</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>
R-squared	0.124	0.125	0.125	0.076	0.077	0.078	0.073	0.073	0.074

Standard errors are in parentheses; \* p<0.05, \*\* p<0.01, \*\*\* p<0.001. All estimations are weighted.

Table 10: The impact of early marriage on the likelihood of neonatal mortality - Probit estimations - marginal effects

	All			Sons			Daughters		
	(1)	(2)	(3)	(1b)	(2b)	(3b)	(1g)	(2g)	(3g)
<b>Union characteristics</b>									
Early marriage	0.0167* (0.0102)	0.0161 (0.0102)	0.0163 (0.0102)	0.00997 (0.00804)	0.0102 (0.00810)	0.0103 (0.00802)	0.00953 (0.00674)	0.00930 (0.00671)	0.00899 (0.00668)
No. co-wives	0.00644 (0.00490)	0.00631 (0.00489)	0.00783 (0.00509)	0.00627 (0.00386)	0.00621 (0.00389)	0.00697* (0.00402)	0.00221 (0.00331)	0.00229 (0.00329)	0.00254 (0.00342)
Divorced	0.0224** (0.0105)	0.0225** (0.0105)	0.0236** (0.0105)	0.0148* (0.00832)	0.0150* (0.00837)	0.0164** (0.00837)	0.00997 (0.00711)	0.00962 (0.00705)	0.00985 (0.00702)
Lives with partner	-0.0105 (0.00892)	-0.0101 (0.00891)	-0.0103 (0.00884)	-0.00820 (0.00727)	-0.00805 (0.00731)	-0.00801 (0.00722)	-0.00609 (0.00604)	-0.00577 (0.00600)	-0.00575 (0.00595)
Length of union	-0.00214 (0.00680)	-0.00273 (0.00687)	-0.00270 (0.00686)	-0.00498 (0.00543)	-0.00564 (0.00547)	-0.00595 (0.00541)	0.00156 (0.00436)	0.00126 (0.00442)	0.00143 (0.00440)
Spousal gap			-0.000612 (0.000395)			-0.000437 (0.000313)			-0.000175 (0.000268)
Partner educ. attain. dummies	No	No	Yes	No	No	Yes	No	No	Yes
<b>Individual characteristics</b>									
Age	0.0104** (0.00418)	0.0104** (0.00416)	0.0103** (0.00416)	0.00590* (0.00337)	0.00611* (0.00337)	0.00601* (0.00334)	0.00601** (0.00268)	0.00599** (0.00267)	0.00602** (0.00266)
Age-squared	-4.93e-05 (5.66e-05)	-4.95e-05 (5.64e-05)	-4.98e-05 (5.63e-05)	-5.37e-06 (4.55e-05)	-6.37e-06 (4.56e-05)	-5.50e-06 (4.53e-05)	-4.77e-05 (3.67e-05)	-4.69e-05 (3.65e-05)	-4.83e-05 (3.62e-05)
Christian	-0.0395 (0.0248)	-0.0381 (0.0239)	-0.0388* (0.0236)	-0.0164 (0.0189)	-0.0154 (0.0191)	-0.0151 (0.0191)	-0.0218 (0.0163)	-0.0227 (0.0144)	-0.0225 (0.0142)
Contraception	-0.00464 (0.00865)	-0.00285 (0.00866)	-0.00298 (0.00867)	-0.00558 (0.00688)	-0.00507 (0.00689)	-0.00482 (0.00692)	-0.00164 (0.00575)	-0.000397 (0.00576)	-0.000203 (0.00572)
Age at first birth	-0.00840** (0.00134)	-0.00827** (0.00134)	-0.00835** (0.00133)	-0.00604*** (0.00107)	-0.00600*** (0.00107)	-0.00602*** (0.00106)	-0.00403*** (0.000888)	-0.00396*** (0.000886)	-0.00397*** (0.000879)
Average birth interval	-0.00323*** (0.000468)	-0.00320*** (0.000455)	-0.00321*** (0.000453)	-0.00207*** (0.000374)	-0.00207*** (0.000378)	-0.00207*** (0.000373)	-0.00182*** (0.000336)	-0.00184*** (0.000292)	-0.00184*** (0.000289)
Ethnic group dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>Household characteristics</b>									
Rural	0.0165* (0.00946)	0.0154 (0.00951)	0.0147 (0.00957)	0.00975 (0.00759)	0.00940 (0.00767)	0.00856 (0.00771)	0.0100 (0.00637)	0.00926 (0.00636)	0.00859 (0.00637)
No. women	0.00715** (0.00330)	0.00707** (0.00329)	0.00724** (0.00330)	0.00263 (0.00266)	0.00261 (0.00266)	0.00279 (0.00265)	0.00442** (0.00211)	0.00443** (0.00211)	0.00445** (0.00211)
No. children	-0.00391 (0.00252)	-0.00393 (0.00251)	-0.00412 (0.00251)	-0.00283 (0.00202)	-0.00287 (0.00203)	-0.00301 (0.00202)	-0.00255 (0.00170)	-0.00258 (0.00169)	-0.00269 (0.00169)
No. members	-0.00227** (0.00103)	-0.00233** (0.00103)	-0.00233** (0.00103)	-0.000944 (0.000831)	-0.000994 (0.000835)	-0.00102 (0.000826)	-0.000973 (0.000678)	-0.001000 (0.000675)	-0.000960 (0.000674)
Wealth dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Distance to drinking water dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>Observations</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>

Robust standard errors are in parentheses; \* p<0.1, \*\* p<0.05, \*\*\* p<0.01. All estimations are weighted.

Table 11: The impact of early marriage on the number of neonatal deaths - OLS estimations.

	All			Sons			Daughters		
	(1)	(2)	(3)	(1b)	(2b)	(3b)	(1g)	(2g)	(3g)
<b>Union characteristics</b>									
Early marriage	0.0492*** (0.0167)	0.0489*** (0.0166)	0.0490*** (0.0167)	0.0327** (0.0129)	0.0325** (0.0129)	0.0329** (0.0129)	0.0165* (0.00895)	0.0164* (0.00900)	0.0161* (0.00904)
No. co-wives	0.0163* (0.00879)	0.0163* (0.00884)	0.0179* (0.00949)	0.00978 (0.00663)	0.00966 (0.00671)	0.0102 (0.00735)	0.00654 (0.00501)	0.00663 (0.00501)	0.00767 (0.00535)
Divorced	0.0252 (0.0214)	0.0248 (0.0215)	0.0272 (0.0218)	0.0199 (0.0169)	0.0198 (0.0170)	0.0218 (0.0172)	0.00524 (0.00963)	0.00495 (0.00966)	0.00548 (0.00959)
Lives with partner	-0.0173 (0.0123)	-0.0167 (0.0123)	-0.0170 (0.0123)	-0.0132 (0.00926)	-0.0129 (0.00924)	-0.0131 (0.00925)	-0.00417 (0.00706)	-0.00382 (0.00711)	-0.00389 (0.00711)
Length of union	-0.0123 (0.0110)	-0.0133 (0.0111)	-0.0135 (0.0111)	-0.0125 (0.00899)	-0.0131 (0.00905)	-0.0136 (0.00905)	0.000257 (0.00505)	-0.000216 (0.00514)	0.000152 (0.00513)
Spousal age gap			-0.00103 (0.000811)			-0.000586 (0.000672)			-0.000448 (0.000359)
Partner educ. attain. dummies	No	No	Yes	No	No	Yes	No	No	Yes
<b>Individual characteristics</b>									
Age	0.00901 (0.00750)	0.00918 (0.00748)	0.00900 (0.00746)	0.00259 (0.00604)	0.00268 (0.00602)	0.00248 (0.00600)	0.00642* (0.00369)	0.00650* (0.00369)	0.00652* (0.00368)
Age-squared	9.33e-05 (0.000124)	9.28e-05 (0.000124)	9.29e-05 (0.000123)	0.000121 (0.000100)	0.000121 (0.000100)	0.000123 (0.000100)	-2.77e-05 (5.38e-05)	-2.77e-05 (5.38e-05)	-2.98e-05 (5.37e-05)
Christian	-0.00788** (0.00391)	-0.00770** (0.00381)	-0.00781** (0.00377)	-0.00398* (0.00223)	-0.00390* (0.00220)	-0.00395* (0.00216)	-0.00389* (0.00227)	-0.00380* (0.00220)	-0.00386* (0.00223)
Contraception	-0.00926 (0.0148)	-0.00666 (0.0147)	-0.00396 (0.0147)	-0.00557 (0.0113)	-0.00418 (0.0111)	-0.00180 (0.0112)	-0.00369 (0.00749)	-0.00248 (0.00768)	-0.00216 (0.00773)
Age at first birth	-0.0158*** (0.00270)	-0.0157*** (0.00269)	-0.0158*** (0.00271)	-0.0102*** (0.00214)	-0.0101*** (0.00214)	-0.0101*** (0.00214)	-0.00563*** (0.00129)	-0.00556*** (0.00129)	-0.00567*** (0.00130)
Average birth interval	-0.00414*** (0.000463)	-0.00411*** (0.000459)	-0.00412*** (0.000462)	-0.00244*** (0.000376)	-0.00243*** (0.000376)	-0.00244*** (0.000377)	-0.00170*** (0.000187)	-0.00168*** (0.000180)	-0.00168*** (0.000181)
Educational attainment dummies	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Ethnic group dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>Household characteristics</b>									
Rural	0.0268** (0.0129)	0.0258** (0.0130)	0.0230* (0.0132)	0.0139 (0.00917)	0.0133 (0.00926)	0.0111 (0.00948)	0.0130 (0.00803)	0.0125 (0.00805)	0.0119 (0.00811)
No. women	0.00825* (0.00467)	0.00818* (0.00466)	0.00849* (0.00465)	0.00468 (0.00363)	0.00464 (0.00361)	0.00490 (0.00361)	0.00357 (0.00260)	0.00354 (0.00261)	0.00359 (0.00261)
No. children	-0.00251 (0.00451)	-0.00261 (0.00450)	-0.00317 (0.00443)	0.000890 (0.00349)	0.000835 (0.00348)	0.000354 (0.00342)	-0.00340 (0.00219)	-0.00345 (0.00219)	-0.00352 (0.00219)
No. members	-0.00328* (0.00172)	-0.00335* (0.00172)	-0.00334* (0.00172)	-0.00242* (0.00131)	-0.00244* (0.00131)	-0.00244* (0.00131)	-0.000858 (0.000888)	-0.000902 (0.000893)	-0.000898 (0.000895)
Wealth dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Distance to drinking water dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.282** (0.139)	0.279** (0.140)	0.313** (0.149)	0.233** (0.113)	0.232** (0.114)	0.256** (0.121)	0.0489 (0.0574)	0.0470 (0.0577)	0.0568 (0.0596)
<b>Observations</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>
R-squared	0.064	0.065	0.066	0.045	0.045	0.046	0.033	0.034	0.035

Standard errors are in parent heses: \* p<0.05, \*\* p<0.01, \*\*\* p<0.001. All estimations are weighted.

Table 12: Are missing heights random?

	Missing Height	Non-missing Height	Mean test diff. (p-value)
Early marriage	36.1%	36.4%	0.67
Under-five mortality prevalence	29.5%	29.7%	0.85
No. offspring dead under five	0.44	0.46	0.20
Infant mortality prevalence	21.9%	22.4%	0.48
No. offspring dead before 1 y.o	0.29	0.31	0.29
Neonatal mortality prevalence	13%	13.4%	0.49
No. offspring dead before 1 month	0.17	0.17	0.91
Age	29.3	29.2	0.49
Age at first birth	19	19	0.89
Rural residence	68.1%	67.2%	0.24
Never enrolled at school	74%	74.6%	0.37

T-tests are carried out on the sub-population of women who gave birth during the five years preceding the survey and for whom anthropometric data were collected.

Table 13: The impact of early marriage on the likelihood of under-five mortality - Probit estimations - Marginal effects - Height investigation.

	All		Sons		Daughters	
	(Height)	(Height sample)	(Height)	(Height sample)	(Height)	(Height sample)
<b>Union characteristics</b>		(Baseline)		(Baseline)		(Baseline)
Early marriage	0.00219 (0.0231)	0.00395 (0.0232)	0.0287 (0.0192)	0.0292 (0.0193)	-0.0309* (0.0167)	-0.0305* (0.0167)
No. co-wives	0.0290** (0.0123)	0.0280** (0.0123)	0.0200** (0.0100)	0.0195* (0.0100)	0.0181** (0.00904)	0.0176* (0.00909)
Divorced	0.0170 (0.0247)	0.0150 (0.0247)	0.0158 (0.0200)	0.0152 (0.0200)	-0.0125 (0.0168)	-0.0135 (0.0168)
Lives with partner	-0.0336* (0.0203)	-0.0319 (0.0202)	-0.0354** (0.0166)	-0.0347** (0.0166)	-0.0113 (0.0152)	-0.0105 (0.0152)
Length of union	0.000488 (0.0162)	-0.000218 (0.0165)	-0.0156 (0.0131)	-0.0159 (0.0133)	0.0193 (0.00784)	0.0198* (0.0119)
Spousal age gap	0.000571 (0.000903)	0.000569 (0.000908)	0.000159 (0.000760)	0.000157 (0.000762)	0.000682 (0.000700)	0.000670 (0.000700)
Partner educ. attain. dummies	Yes	Yes	Yes	Yes	Yes	Yes
<b>Individual characteristics</b>						
Age	0.0359*** (0.00986)	0.0360*** (0.00989)	0.0280*** (0.00806)	0.0281*** (0.00808)	0.0230*** (0.00722)	0.0231*** (0.00723)
Age-squared	-0.000287** (0.000135)	-0.000285** (0.000135)	-0.000219** (0.000109)	-0.000219** (0.000109)	-0.000221** (9.81e-05)	-0.000223** (9.82e-05)
Christian	-0.0114 (0.0223)	-0.00895 (0.0154)	-0.00202 (0.00398)	-0.00149 (0.00398)	-0.0372 (0.0373)	-0.0365 (0.0372)
Contraception	-0.0301 (0.0208)	-0.0313 (0.0208)	-0.0301* (0.0166)	-0.0305* (0.0166)	-0.0106 (0.0152)	-0.0113 (0.0152)
Age at first birth	-0.0218*** (0.00328)	-0.0216*** (0.00329)	-0.0121*** (0.00267)	-0.0121*** (0.00267)	-0.0142*** (0.00225)	-0.0140*** (0.00227)
Average birth interval	-0.00653*** (0.00104)	-0.00627*** (0.00104)	-0.00389*** (0.000857)	-0.00388*** (0.000857)	-0.00584*** (0.000744)	-0.00583*** (0.000753)
Height	1.72e-05*** (5.43e-06)	Yes	6.02e-06 (4.34e-06)	Yes	8.25e-06** (3.92e-06)	Yes
Educ. attain. dummies	Yes	Yes	Yes	Yes	Yes	Yes
Ethnic group dummies	Yes	Yes	Yes	Yes	Yes	Yes
<b>Household characteristics</b>						
Rural	0.0308 (0.0233)	0.0288 (0.0233)	0.0498*** (0.0193)	0.0492** (0.0193)	-0.00409 (0.0179)	-0.00492 (0.0179)
No. women	0.0161** (0.00794)	0.0174** (0.00794)	0.0145** (0.00658)	0.0149** (0.00658)	0.0088 (0.00589)	0.00888 (0.00594)
No. children	-0.00292 (0.00586)	-0.00208 (0.00589)	-0.00465 (0.00486)	-0.00430 (0.00489)	-0.000716 (0.00426)	-0.000428 (0.00427)
No. members	-0.00587** (0.00243)	-0.00603** (0.00242)	-0.00343* (0.00197)	-0.00349* (0.00197)	-0.00345* (0.00186)	-0.00353* (0.00186)
Wealth dummies	Yes	Yes	Yes	Yes	Yes	Yes
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes
Distance to drinking water d.	Yes	Yes	Yes	Yes	Yes	Yes
<b>Observations</b>	<b>5 074</b>	<b>5 074</b>	<b>5 074</b>	<b>5 074</b>	<b>5 074</b>	<b>5 074</b>
	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>

Robust standard errors are in parentheses; \* p<0.1, \*\* p<0.05, \*\*\* p<0.01. All estimations are weighted.

Table 14: The impact of early marriage on the number of under five deaths - OLS estimations - Height investigation.

	All			Sons			Daughters		
	(Height)	(Height sample)	(Baseline)	(Height)	(Height sample)	(Baseline)	(Height)	(Height sample)	(Baseline)
<b>Union characteristics</b>									
Early marriage	0.0518 (0.0458)	0.0533 (0.0458)	0.106*** (0.0254)	0.0703** (0.0336)	0.0706** (0.0336)	0.0742*** (0.0180)	-0.0185 (0.0264)	-0.0172 (0.0264)	0.0315** (0.0154)
No. co-wives	0.0641*** (0.0242)	0.0630*** (0.0242)	0.0407*** (0.0140)	0.0296* (0.0169)	0.0294* (0.0169)	0.0198** (0.00998)	0.0345** (0.0152)	0.0335** (0.0153)	0.0209** (0.00902)
Divorced	0.0231 (0.0558)	0.0209 (0.0559)	0.0105 (0.0283)	0.0646 (0.0437)	0.0643 (0.0438)	0.0121 (0.0208)	-0.0415 (0.0258)	-0.0433* (0.0259)	-0.00160 (0.0161)
Lives with partner	-0.0634* (0.0329)	-0.0616* (0.0329)	-0.0486** (0.0198)	-0.0479** (0.0215)	-0.0477** (0.0215)	-0.0326** (0.0134)	-0.0154 (0.0216)	-0.0140 (0.0217)	-0.0161 (0.0124)
Length of union	-0.0401 (0.0303)	-0.0408 (0.0304)	-0.0108 (0.0161)	-0.0448* (0.0229)	-0.0449** (0.0229)	-0.0169 (0.0120)	0.00472 (0.0161)	0.00410 (0.0161)	0.00606 (0.00891)
Spousal age gap	0.00163 (0.00253)	0.00162 (0.00253)	-0.00130 (0.00115)	-3.77e-05 (0.00175)	-3.82e-05 (0.00175)	-0.000766 (0.000776)	0.00166 (0.00153)	0.00166 (0.00153)	-0.000539 (0.000719)
Partner educ. attain. dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>Individual characteristics</b>									
Age	0.0430** (0.0187)	0.0429** (0.0187)	0.0623*** (0.0106)	0.0171 (0.0141)	0.0171 (0.0141)	0.0291*** (0.00773)	0.0259** (0.0106)	0.0259** (0.0106)	0.0332*** (0.00620)
Christian	-0.0121** (0.00571)	-0.0106* (0.00568)	-0.0120** (0.00508)	-0.00426 (0.00513)	-0.00404 (0.00515)	-0.00696** (0.00351)	-0.00783** (0.00393)	-0.00657* (0.00382)	-0.00504* (0.00299)
Contraception	-0.0863** (0.0381)	-0.0875** (0.0382)	-0.0328 (0.0210)	-0.0472 (0.0288)	-0.0474* (0.0288)	-0.0189 (0.0149)	-0.0391** (0.0197)	-0.0401** (0.0198)	-0.0139 (0.0123)
Age at first birth	-0.0455*** (0.00675)	-0.0455*** (0.00678)	-0.0446*** (0.00364)	-0.0236*** (0.00534)	-0.0236*** (0.00534)	-0.0255*** (0.00272)	-0.0219*** (0.00348)	-0.0218*** (0.00351)	-0.0192*** (0.00207)
Average birth interval	-0.0104*** (0.00127)	-0.0103*** (0.00128)	-0.0108*** (0.000649)	-0.00526*** (0.000974)	-0.00525*** (0.000975)	-0.00570*** (0.000469)	-0.00510*** (0.000514)	-0.00504*** (0.000523)	-0.00508*** (0.000312)
Height	1.90e-05** (9.18e-06)	1.90e-05** (9.18e-06)	Yes	2.82e-06 (5.84e-06)	2.82e-06 (5.84e-06)	Yes	1.62e-05** (7.34e-06)	Yes	Yes
Educational attainment dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ethnic group dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>Household characteristics</b>									
Rural	0.0689* (0.0354)	0.0668* (0.0354)	0.0831*** (0.0209)	0.0620*** (0.0238)	0.0617*** (0.0237)	0.0563*** (0.0146)	0.00685 (0.0238)	0.00508 (0.0239)	0.0268** (0.0134)
No. women	0.0232* (0.0134)	0.0243* (0.0134)	0.0290*** (0.00769)	0.0149 (0.00913)	0.0150* (0.00910)	0.0154*** (0.00580)	0.00829 (0.00841)	0.00925 (0.00847)	0.0137*** (0.00449)
No. children	0.00914 (0.0118)	0.0100 (0.0117)	0.00758 (0.00643)	0.00945 (0.00870)	0.00958 (0.00868)	0.00641 (0.00476)	-0.000311 (0.00634)	0.000436 (0.00630)	0.00117 (0.00362)
No. members	-0.0121** (0.00493)	-0.0122** (0.00492)	-0.0129*** (0.00270)	-0.00745** (0.00338)	-0.00747** (0.00338)	-0.00710*** (0.00205)	-0.00467* (0.00283)	-0.00477* (0.00283)	-0.00583*** (0.00148)
Wealth dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Distance to drinking water dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.430 (0.378)	0.459 (0.376)	0.123 (0.186)	0.336 (0.300)	0.340 (0.299)	0.151 (0.142)	0.0945 (0.169)	0.119 (0.168)	-0.0275 (0.0962)
<b>Observations</b>	<b>5 074</b>	<b>5 074</b>	<b>14 415</b>	<b>5 074</b>	<b>5 074</b>	<b>14 415</b>	<b>5 074</b>	<b>5 074</b>	<b>14 415</b>
R-squared	0.204	0.203	0.206	0.126	0.126	0.129	0.138	0.136	0.130

Standard errors are in parentheses; \* p<0.1, \*\* p<0.05, \*\*\* p<0.01. All estimations are weighted. Estimations include controls for age-squared.

Table 15: Household conditional logit regressions - The likelihood of under-five mortality - Marginal effects.

	All households			Husband's HH			Other virilocal HH		
	All (1)	Sons (2)	Daughters (3)	All (4)	Sons (5)	Daughters (6)	All (7)	Sons (8)	Daughters (9)
Early marriage	0.210 (0.139)	0.288** (0.143)	-0.088 (0.140)	0.272 (0.201)	0.237 (0.201)	-0.058 (0.244)	-0.094 (0.367)	0.022 (0.420)	-0.106 (0.481)
HH Head wife	0.327 (0.290)	0.287 (0.305)	-0.115 (0.306)						
HH Head from own family	0.216 (0.408)	0.350 (0.343)	-0.314 (0.338)						
HH Head from family-in-law	0.038 (0.295)	0.065 (0.317)	-0.171 (0.301)						
HH Head other relative	0.156 (0.293)	-0.005 (0.306)	0.069 (0.312)						
HH Head not related	0.167 (0.294)	0.225 (0.308)	-0.133 (0.305)						
Second wife				0.289 (0.208)	0.332 (0.208)	0.150 (0.233)			
Third wife				0.146 (0.363)	0.048 (0.358)	0.446 (0.404)			
Fourth wife or more				-0.046 (0.650)	0.465 (0.669)	-0.211 (0.889)			
No. co-wives	-0.054 (0.087)	-0.058 (0.085)	-0.046 (0.093)	0.805 (0.513)	0.221 (0.523)	0.221 (0.523)	-0.013 (0.300)	-0.427 (0.300)	0.274 (0.476)
Divorced	0.075 (0.136)	-0.017 (0.128)	0.175 (0.134)	-0.249 (0.262)	-0.223 (0.248)	-0.030 (0.271)	0.742* (0.429)	-0.153 (0.575)	0.752 (0.494)
Lives with partner	0.011 (0.152)	0.040 (0.148)	-0.096 (0.160)				-0.098 (0.372)	-0.049 (0.452)	-0.425 (0.528)
Length of union	0.075 (0.087)	-0.027 (0.089)	0.150 (0.094)				0.366 (0.309)	0.114 (0.326)	0.488 (0.380)
Spousal age gap	-0.001 (0.006)	0.003 (0.006)	-0.002 (0.006)	0.003 (0.025)	-0.025 (0.027)	0.023 (0.027)	-0.015 (0.017)	0.018 (0.027)	-0.017 (0.021)
Age	0.073*** (0.019)	0.083*** (0.019)	0.070*** (0.021)	0.123*** (0.032)	0.086*** (0.031)	0.139*** (0.038)	-0.001 (0.070)	0.106 (0.081)	-0.031 (0.081)
Contraception	0.088 (0.138)	0.094 (0.134)	-0.135 (0.137)	0.205 (0.227)	0.131 (0.234)	-0.027 (0.263)	-0.067 (0.355)	0.002 (0.433)	0.212 (0.481)
Age at first birth	-0.043** (0.022)	-0.015 (0.021)	-0.092*** (0.021)	-0.062* (0.035)	-0.033 (0.031)	-0.138*** (0.040)	-0.054 (0.064)	-0.196** (0.081)	0.027 (0.077)
Average birth interval	-0.027*** (0.005)	-0.019*** (0.005)	-0.046*** (0.006)	-0.021* (0.012)	-0.015 (0.010)	-0.053*** (0.011)	-0.041*** (0.015)	-0.046*** (0.019)	-0.041** (0.020)
<b>Observations</b>	<b>3 947</b>	<b>3 292</b>	<b>3 009</b>	<b>964</b>	<b>881</b>	<b>796</b>	<b>378</b>	<b>278</b>	<b>255</b>

Robust standard errors are in parentheses; \* p<0.1, \*\* p<0.05, \*\*\* p<0.01. All estimations are weighted.

Table 16: OLS regressions with household fixed effects - Number of dead children under five.

	All households			Husband's HH		Other virilocal HH			
	All (1)	Sons (2)	Daughters (3)	All (4)	Sons (5)	Daughters (6)	All (7)	Sons (8)	Daughters (9)
Early marriage	0.0432 (0.0448)	0.0579 (0.0376)	-0.00820 (0.0280)	0.139* (0.0831)	0.0740 (0.0605)	0.0652 (0.0508)	-0.0360 (0.0960)	-0.0422 (0.0680)	0.00615 (0.0674)
HH Head wife	0.0714 (0.0938)	0.0325 (0.0723)	-0.0114 (0.0610)						
HH Head from own family	0.0958 (0.108)	0.104 (0.0866)	-0.0332 (0.0645)						
HH Head from husband's family	0.0313 (0.106)	0.0318 (0.0754)	-0.0519 (0.0670)						
HH Head other relative	0.0702 (0.0891)	0.0247 (0.0711)	0.00909 (0.0566)						
HH Head not related	0.0351 (0.0928)	-0.0135 (0.0733)	-0.0306 (0.0608)						
Second wife				0.0464 (0.0865)	0.0324 (0.0649)	0.0140 (0.0488)			
Third wife				0.0934 (0.147)	0.0863 (0.111)	0.00715 (0.0857)			
Fourth wife or more				0.0646 (0.252)	0.0436 (0.173)	0.0210 (0.162)			
Divorced	-0.0278 (0.0418)		-0.00252 (0.0256)	-0.0377 (0.0950)	-0.0706 (0.0724)	0.0329 (0.0529)	0.0468 (0.0923)	-0.0230 (0.0751)	0.0698 (0.0557)
Lives with partner	0.0112 (0.0434)	0.0247 (0.0348)	0.000417 (0.0272)				-0.0979 (0.0793)	0.00514 (0.0654)	-0.103** (0.0514)
Length of union	0.0176 (0.0291)	-0.0117 (0.0263)	0.0230 (0.0170)				0.0756 (0.0727)	-0.00239 (0.0446)	0.0780 (0.0562)
Spousal age gap	0.00150 (0.00167)	-2.27e-05 (0.00126)	-0.000343 (0.000988)	0.00432 (0.00944)	0.00184 (0.00678)	0.00249 (0.00462)	0.00187 (0.00365)	-0.000661 (0.00235)	0.00253 (0.00322)
Age	0.0404*** (0.00639)	0.0266*** (0.00548)	0.0155*** (0.00376)	0.0595*** (0.0114)	0.0327*** (0.00830)	0.0268*** (0.00608)	0.0193 (0.0164)	0.0205** (0.00985)	-0.00120 (0.0123)
Contraception	0.088 (0.138)	0.094 (0.134)	-0.135 (0.137)	0.205 (0.227)	0.131 (0.234)	-0.027 (0.263)	-0.067 (0.355)	0.002 (0.433)	0.212 (0.481)
Age at first birth	-0.0284*** (0.00628)	-0.0122** (0.00537)	-0.0178*** (0.00363)	-0.0260* (0.0137)	-0.00394 (0.00922)	-0.0221*** (0.00806)	-0.0255 (0.0178)	-0.0288*** (0.0105)	0.00328 (0.0122)
Average birth interval	-0.00891*** (0.000961)	-0.00566*** (0.000697)	-0.00445*** (0.000469)	-0.0147*** (0.00316)	-0.00708*** (0.00213)	-0.00758*** (0.00150)	-0.00688*** (0.00198)	-0.00428*** (0.00146)	-0.00260* (0.00147)
Constant	0.116 (0.238)	-0.0808 (0.196)	0.195 (0.175)	-0.247 (0.764)	-0.239 (0.598)	-0.00838 (0.348)	1.424** (0.642)	0.972* (0.590)	0.451** (0.227)
<b>Observations</b>	<b>14 415</b>	<b>11 732</b>	<b>14 415</b>	<b>7 756</b>	<b>7 756</b>	<b>7 756</b>	<b>2 093</b>	<b>2 093</b>	<b>2 093</b>
Number of HH	10 010	8 608	10 010	6 499	6 499	6 499	1 588	1 588	1 588
R-squared	0.151	0.097	0.094	0.148	0.093	0.101	0.110	0.084	0.074

Robust standard errors are in parentheses; \* p<0.1, \*\* p<0.05, \*\*\* p<0.01. All estimations are weighted.



Table 17: The impact of early marriage by household-head relationship.  
 Probit and OLS estimations - Marginal effects.

	Probit			OLS		
	All	Sons	Daughters	All	Sons	Daughters
	<b>&lt;5 Child death likelihood</b>			<b>Number of dead children &lt;5</b>		
Early marriage	0.108** (0.0443)	0.128*** (0.0389)	0.00279 (0.0297)	0.199** (0.0776)	0.179*** (0.0524)	0.0202 (0.0497)
HH Head	-0.00174 (0.0356)	-0.0105 (0.0297)	-0.0213 (0.0240)	-0.113** (0.0496)	-0.0653* (0.0333)	-0.0475 (0.0334)
HH Head wife	-0.0396 (0.0308)	-0.00727 (0.0266)	-0.0434** (0.0214)	-0.112*** (0.0379)	-0.0326 (0.0267)	-0.0795*** (0.0234)
HH Head husband family	-0.0454 (0.0296)	-0.0288 (0.0251)	-0.0247 (0.0210)	-0.0367 (0.0343)	-0.0148 (0.0238)	-0.0220 (0.0212)
HH Head other	0.00154 (0.0297)	0.000299 (0.0255)	0.00687 (0.0219)	0.00128 (0.0357)	9.09e-06 (0.0242)	0.00127 (0.0222)
EW head	-0.109** (0.0485)	-0.0897*** (0.0336)	-0.0170 (0.0396)	-0.170 (0.109)	-0.150** (0.0716)	-0.0199 (0.0704)
EW wife	-0.0560 (0.0414)	-0.0758** (0.0305)	0.0146 (0.0315)	-0.0599 (0.0806)	-0.0858 (0.0558)	0.0258 (0.0504)
EW virilocal	-0.0713 (0.0441)	-0.0883*** (0.0290)	0.0200 (0.0381)	-0.191** (0.0808)	-0.173*** (0.0553)	-0.0186 (0.0521)
EW other	-0.0583 (0.0448)	-0.0697** (0.0317)	0.0139 (0.0360)	-0.126 (0.0846)	-0.140** (0.0580)	0.0132 (0.0544)
Constant				0.242 (0.189)	0.196 (0.144)	0.0464 (0.0994)
<b>Observations</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>
R-squared				0.208	0.131	0.132

Robust standard errors are in parentheses; \* p<0.1 \*\* p<0.05 \*\*\* p<0.01  
 The omitted categories are own family household and EW own family household.  
 All estimations are weighted.

Table 18: Probit estimations - controlling for mother's siblings' death status before age 5  
Under five mortality - Marginal effects

	All women		Women $\geq$ 25 years old	
	(All)	(Sons) (Daughters)	(All)	(Sons) (Daughters)
Early marriage	0.0460*** (0.0147)	0.0441*** (0.0122)	0.0442*** (0.0163)	0.0462*** (0.0137)
No. sisters	-0.000358 (0.00308)	-0.00289 (0.00255)	-0.000151 (0.00341)	-0.00266 (0.00284)
No. brothers	0.00758** (0.00299)	0.00826*** (0.00244)	0.00654** (0.00330)	0.00771*** (0.00273)
No. dead brothers $<5$	0.0256*** (0.00924)	0.00503 (0.00772)	0.0269** (0.0105)	0.00399 (0.00893)
No. dead sisters $<5$	0.0240** (0.0110)	0.00834 (0.00881)	0.0276** (0.0122)	0.00851 (0.00981)
<b>Observations</b>	<b>14 415</b>	<b>14 415</b>	<b>12 224</b>	<b>12 224</b>

Robust standard errors are in parentheses; \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . All estimations are weighted.

Table 19: OLS estimations - controlling for mother's siblings' death status before age 5  
Under five mortality.

	All women		Women $\geq$ 25 years old	
	(All)	(Sons)	(All)	(Sons)
				(Daughters)
Early marriage	0.105*** (0.0254)	0.0741*** (0.0180)	0.0311** (0.0154)	0.120*** (0.0300)
				(Daughters)
No. sisters	-0.00602 (0.00493)	-0.00623* (0.00375)	0.000208 (0.00287)	0.0871*** (0.0212)
				(Sons)
No. brothers	0.00919* (0.00489)	0.00764** (0.00358)	0.00155 (0.00287)	-0.00615 (0.00422)
				(Sons)
No. dead brothers <5	0.0168 (0.0163)	-0.000209 (0.0105)	0.0170 (0.0118)	0.00720* (0.00408)
				(Sons)
No. dead sisters <5	0.0356* (0.0204)	0.00926 (0.0148)	0.0263** (0.0134)	-0.000643 (0.0120)
				(Sons)
Constant	0.107 (0.190)	0.144 (0.145)	-0.0372 (0.0964)	0.0326* (0.0180)
<b>Observations</b>	<b>14 415</b>	<b>14 415</b>	<b>14 415</b>	<b>12 224</b>
R-squared	0.207	0.129	0.130	0.128

Robust standard errors are in parentheses; \* p<0.1, \*\* p<0.05, \*\*\* p<0.01. All estimations are weighted.

Table 20: The impact of early marriage by current age - Probit estimates of <5 mortality - Marginal effects.

	All		Sons		Daughters	
	(All)	(First union)	(All)	(First union)	(All)	(First union)
<b>Union characteristics</b>						
EW (15-19)	0.198*** (0.0525)	0.189*** (0.0563)	0.106** (0.0526)	0.112** (0.0565)	0.169*** (0.0535)	0.154*** (0.0535)
EW (20-24)	0.0947*** (0.0285)	0.0967*** (0.0303)	0.0665** (0.0266)	0.0686** (0.0281)	0.0653*** (0.0239)	0.0651*** (0.0243)
EW (25-29)	0.0825*** (0.0225)	0.0738*** (0.0234)	0.0589*** (0.0200)	0.0360* (0.0195)	0.0503*** (0.0178)	0.0600*** (0.0192)
EW (30-34)	0.0287 (0.0248)	0.0538* (0.0284)	0.0449** (0.0218)	0.0510** (0.0246)	0.00370 (0.0168)	0.0158 (0.0185)
EW (35-39)	0.0348 (0.0245)	0.0428 (0.0278)	0.0510** (0.0211)	0.0556** (0.0242)	-0.0117 (0.0157)	-0.0127 (0.0166)
EW (40-44)	-0.0223 (0.0240)	-0.0171 (0.0272)	0.00758 (0.0196)	0.000366 (0.0216)	-0.0181 (0.0160)	-0.00988 (0.0178)
EW (45-49)	0.0309 (0.0315)	0.0103 (0.0362)	0.0381 (0.0259)	0.0171 (0.0285)	0.00229 (0.0205)	-0.00777 (0.0216)
No. co-wives	0.0137* (0.00731)	0.0175** (0.00833)	0.0102* (0.00589)	0.0107 (0.00657)	0.00884* (0.00531)	0.00927 (0.00591)
Divorced	0.0238* (0.0143)	0.00731 (0.0143)	0.0117 (0.0115)	0.0117 (0.0105)	0.0102 (0.0105)	0.0102 (0.0105)
Lives with partner	-0.0341*** (0.0126)	-0.0271* (0.0139)	-0.0236** (0.0106)	-0.0107 (0.0115)	-0.0173* (0.00930)	-0.0249** (0.0102)
Length of union	0.0123 (0.00970)	0.00318 (0.0109)	-0.00457 (0.00789)	-0.00670 (0.00884)	0.0161** (0.00687)	0.00585 (0.00745)
Spousal age gap	-0.000860 (0.000562)	-0.00128** (0.000620)	-0.000468 (0.000462)	-0.000849* (0.000513)	-0.000358 (0.000425)	-0.000194 (0.000451)
<b>Individual characteristics</b>						
Age	0.0552*** (0.00797)	0.0559*** (0.00868)	0.0319*** (0.00663)	0.0352*** (0.00711)	0.0432*** (0.00581)	0.0426*** (0.00611)
Age-squared	-0.000561*** (0.000112)	-0.000540*** (0.000123)	-0.000267*** (9.14e-05)	-0.000309*** (9.95e-05)	-0.000488*** (8.10e-05)	-0.000454*** (8.55e-05)
Age at first birth	-0.0210*** (0.00203)	-0.0226*** (0.00236)	-0.0144*** (0.00167)	-0.0150*** (0.00191)	-0.0124*** (0.00138)	-0.0138*** (0.00152)
Average birth interval	-0.00633*** (0.000593)	-0.00776*** (0.000688)	-0.00426*** (0.000506)	-0.00509*** (0.000561)	-0.00491*** (0.000471)	-0.00560*** (0.000525)
<b>Household characteristics</b>						
<b>Observations</b>	<b>14 415</b>	<b>11 732</b>	<b>14 415</b>	<b>11 732</b>	<b>14 415</b>	<b>11 732</b>

Robust standard errors are in parentheses; \* p<0.1, \*\* p<0.05, \*\*\* p<0.01. All estimations are weighted. Religion, contraception, ethnic group dummies, woman and partner education dummies are included.

Table 21: The impact of early marriage by length of union - Probit estimates of <5 mortality - Marginal effects.

	All		Sons		Daughters	
	(All)	(First union)	(All)	(First union)	(All)	(First union)
<b>Union characteristics</b>						
EW (0-4)	0.111* (0.0590)	0.114* (0.0624)	0.0569 (0.0550)	0.0615 (0.0584)	0.106** (0.0533)	0.116** (0.0558)
EW (5-9)	0.0868*** (0.0287)	0.0878*** (0.0306)	0.0510* (0.0265)	0.0579** (0.0282)	0.0711*** (0.0242)	0.0683*** (0.0245)
EW (10-14)	0.0871*** (0.0217)	0.0837*** (0.0232)	0.0634*** (0.0193)	0.0447** (0.0196)	0.0546*** (0.0179)	0.0634*** (0.0192)
EW (15-19)	0.0453* (0.0257)	0.0646** (0.0286)	0.0572** (0.0229)	0.0597** (0.0250)	0.00336 (0.0166)	0.0117 (0.0180)
EW (20-24)	0.0419* (0.0243)	0.0466* (0.0277)	0.0536** (0.0209)	0.0534** (0.0238)	-0.00168 (0.0161)	-0.00558 (0.0171)
EW (25-29)	-0.0149 (0.0247)	-0.00707 (0.0278)	0.0184 (0.0203)	0.0126 (0.0227)	-0.0144 (0.0165)	-0.00801 (0.0181)
EW (30+)	-0.00542 (0.0289)	-0.0236 (0.0325)	0.0182 (0.0237)	-0.00207 (0.0255)	-0.0264 (0.0175)	-0.0276 (0.0187)
No. co-wives	0.0136* (0.00731)	0.0174** (0.00833)	0.0101* (0.00588)	0.0107 (0.00657)	0.00889* (0.00531)	0.00917 (0.00590)
Divorced	0.0243* (0.0144)	0.0243** (0.0144)	0.0119 (0.0115)	0.0119 (0.0115)	0.0105 (0.0105)	0.0105 (0.0105)
Lives with partner	-0.0344*** (0.0126)	-0.0272* (0.0139)	-0.0238** (0.0106)	-0.0108 (0.0115)	-0.0175* (0.00929)	-0.0249** (0.0101)
Length of union	0.0140 (0.00994)	0.00541 (0.0112)	-0.00442 (0.00805)	-0.00599 (0.00908)	0.0189*** (0.00703)	0.00935 (0.0076)
Spousal age gap	-0.000834 (0.000556)	-0.00124** (0.000616)	-0.000450 (0.000460)	-0.000826 (0.000513)	-0.000355 (0.000419)	-0.000183 (0.000443)
<b>Individual characteristics</b>						
Age	0.0464*** (0.00759)	0.0483*** (0.00820)	0.0265*** (0.00630)	0.0305*** (0.00668)	0.0376*** (0.00550)	0.0390*** (0.00579)
Age-squared	-0.000438*** (0.000107)	-0.000436*** (0.000117)	-0.000191** (8.70e-05)	-0.000244*** (9.42e-05)	-0.000413*** (7.68e-05)	-0.000411*** (8.13e-05)
Age at first birth	-0.0209*** (0.00203)	-0.0225*** (0.00235)	-0.0144*** (0.00166)	-0.0149*** (0.00191)	-0.0124*** (0.00139)	-0.0137*** (0.00152)
Average birth interval	-0.00630*** (0.000597)	-0.00775*** (0.000689)	-0.00425*** (0.000508)	-0.00508*** (0.000562)	-0.00490*** (0.000471)	-0.00559*** (0.000525)
<b>Household characteristics</b>						
	Yes	Yes	Yes	Yes	Yes	Yes
<b>Observations</b>	<b>14 415</b>	<b>11 732</b>	<b>14 415</b>	<b>11 732</b>	<b>14 415</b>	<b>11 732</b>

Robust standard errors are in parentheses; \* p<0.1, \*\* p<0.05, \*\*\* p<0.01. All estimations are weighted. Religion, contraception, ethnic group dummies, woman and partner education dummies are included.