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Child marriage: using the Indonesian family life survey to examine the lives of women and men who married at an early age

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Abstract

An understanding of the experiences of men and women who marry before adulthood is important in motivating social change. Using fixed effects estimation (the inclusion of geographic fixed effects at diminishing levels of aggregation and sister fixed effects where possible) on panel data from the Indonesian Family Life Survey (IFLS), we follow the lives of a sample of 40,800 women and men for up to two decades and examine a wide range of factors associated with child marriage. We examine the lives of both girls and boys who marry early, and the differential experience of girls marrying older men versus young boys. Child marriage is found to be associated with lesser educational attainment, lower earnings and less say in household decision-making, for both men and women. Women are less likely to have a medically-supervised birth and their children are more likely to die, be stunted and perform worse on cognitive tests. Negative factors are mostly exacerbated when young girls marry similarly underage men.

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1 Introduction

Approximately 650 million girls and women alive today were married before their 18th birthday, and if progress is not accelerated, an additional 150 million girls will be married in childhood by 2030 (UNICEF, 2019).

Child marriage is widely considered to be undesirable yet there is very little rigorous research examining its consequences. Greater research attention has been directed at understanding the drivers of child marriage.[1] While this may seem reasonable as an understanding of drivers informs policy that seeks to reduce the prevalence of child marriage, a clear understanding of the lived experience of those who married as children is necessary for raising awareness of the possible consequences of this custom and to validate efforts to dissuade parents from marrying their children at a young age.

The impact of child marriage is entangled with the effects of other confounding variables, such as poverty and low levels of education, that are likely to lead to poor outcomes even in the absence of child marriage. Its impact is thus difficult to isolate and the majority of existing studies of the factors associated with child marriage present descriptive correlations. For example, Jensen and Thornton (2003) pool Demographic Health Survey (DHS) data from 35 countries and show that women who marry young have less education, begin child-rearing earlier, have less decision-making power in the household and are more likely to experience domestic violence. Child marriage is also associated with early childbirth which is a major cause of death among girls aged 15–19, Mayor (2004), and worse mental health. John et al. (2019) find a significant negative association between very early marriage (marriage at 15 years or earlier) and overall psychological well-being using cross sectional data from ever-married women in Niger and Ethiopia. In the context of Indonesia—the focus of this paper—child marriage has been found to be associated with lower educational attainment, less access to social protection, lower probability of a birth with a skilled birth attendant and breastfeeding, higher rates of divorce and a greater probability of working in the informal sector (BPS, 2016, 2017, 2020).[2]

A small number of studies have examined outcomes for children of child brides. Fall et al. (2015) examined the relationship between maternal age and outcomes of offspring in Brazil, Guatemala, India, the Philippines and South Africa. Compared to offspring of mothers aged 20–24, offspring of mothers under the age of 19 had lower birthweight. They also had a greater likelihood of pre-term birth, being stunted by two years of age and failure to complete secondary schooling. Efevbera et al. (2017), in a study using 16 national and sub-national cross-sectional surveys across sub-Saharan Africa, find that children born to women who married before the age of 18 were more likely to be stunted and off-track for development. However, once they control for other confounders, there was no effect of child marriage. This highlights that in many cases it is not clear if child marriage directly impacts offsprings'

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[1] For example, BPS (2016 and 2020), Corno et al. (2020), Corno and Voena (2016) Rumble et al. (2018), Zha (2019) and Adams and Andrew (2019).

[2] These analyses use repeated cross-sections to look at contemporaneous effects. BPS (2017) uses data from the 2013 and 2015 Indonesian National Socioeconomic Survey (SUSENAS) and the 2015 intercensal survey (SUPAS); BPS (2016) uses data from the 2010 Population Census and SUSENAS 2008 to 2013 and 2015 and was recently extended to include SUSENAS 2017 and 2018 in BPS (2020).

outcomes or if it is other characteristics of the mother, like low education, poverty etc., that cause the poor outcomes in their children.

A few studies have gone beyond an associational analysis. In Bangladesh, girls tend to get married once they reach puberty. Field and Ambrus (2008) use the age of menarche in rural Bangladesh to estimate the probability of an early marriage. They find that for each additional year that marriage is delayed, girls gain 0.22 additional years of schooling and are 5.6 percent more likely to be literate. Delayed marriage also results in an increase in the use of preventative health services like prenatal care and tetanus vaccination.

Yount et al. (2016) looks at the effect of early marriage on Intimate Partner Violence (IPV) in Bangladesh using panel data from 2013 and 2014. They find that marrying before the age of 18 is a risk factor for IPV, with the risk of IPV being even stronger for those who were married before the age of 15. Jayawardana (2019) looks at the effect of child marriage on mental health for women in Indonesia using differences-in-differences and matching techniques. She finds that marrying early, particularly by the age of 18 years, has a strong negative effect on women's mental health.[3]

Using a similar strategy to Field and Ambrus (2008), Sekhri and Debnath (2014) and Chari et al. (2017) evaluate the intergenerational consequences of child marriage in India. Using population representative cross-sectional data from India they show that children of women who got married later perform significantly better on arithmetic and reading tasks (Sekhri and Debnath, 2014) and that a one-year delay in the mother's marriage increases the probability of her child completing the recommended vaccinations, the probability of school enrolment, the child's weight-for-height z-score and his/her reading and mathematics test scores (Chari et al., 2017). Asadullah et al. (2016) uses the same identification strategy on household survey data in Bangladesh and obtains similar results—finding a negative effect of mother's early marriage on own schooling as well as children's cognitive outcomes, with larger effects on daughters.

A small number of quasi-experimental published papers use changes in the legal minimum age of marriage to examine the effects of child marriage. Garcia-Hombrados (2022) exploits differential exposure by age to a law that raised the legal age of marriage for women in Ethiopia to study the impacts on infant mortality. They find a 1-year delay in a woman's age at cohabitation during her teenage years reduces the probability of infant death by 3.8 percentage points. Using a similar identification design and examining the same legal change, McGavock (2021) finds a similar delay in marriage with the strongest effect of a delay of 3.4 percentage points for girls aged under 16. She however finds a weaker effect for girls belonging to ethnic groups with strong child marriage preferences and mixed results for women's empowerment outcomes. Rokicki (2021) uses a country-cohort comparison to identify the effect of the same legal change in Ethiopia on fertility behaviour and infant mortality. She finds that in comparison to similar countries in the region, the law reduced the proportion of child marriage by 6.6 percentage points and there was a 6.3 percentage point reduction in adolescent birth. There was no consistent effect on infant death. Bellés-Obrero and Lombardi (2020) exploit the differential adoption of states of a similar

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[3] She also estimates an instrumental variables model using age of menarche, as in Field and Ambrus (2008), but concludes that in the Indonesian context this instrument violates the IV exclusion restriction. We also tried estimating instrumental variables models and encountered similar problems.

legal change in Mexico and found a reduction in the number of registered child marriages. However, they find no effect on school attendance or early fertility rates.

The bulk of research on the factors associated with child marriage has been focused on South Asia, and more recently sub-Saharan Africa, with there being little research on countries in South East Asia, including Indonesia, where child marriage is also prevalent and cultural norms are very different. Approximately eleven percent of Indonesian women aged 20 to 24 in 2018 had been married before the age of 18. This amounts to more than a million Indonesian women, approximately 60,000 of whom were married before the age of 15 (BPS, 2020). Child marriage is also seen as an important policy issue in South East Asia. In September 2019, Indonesia's parliament voted unanimously to raise the legal age of marriage for women from 16 to 19 years, in line with the legal age of marriage for men (House of Representatives of the Republic of Indonesia, 2019). A reduction in child marriage is also a stated target in Indonesia's National Mid-term Development Plan (2020–2024) and a National Strategy on the Prevention of Child Marriage has been developed. The effectiveness of the new law will however depend heavily on the commitment and actions of local (district) governments. A case for change needs to be made.

In this paper we use the Indonesian Family Life Survey (IFLS)—a high quality, longitudinal socioeconomic survey which allows us to follow the lives of a sample of 40,800 women and men, some of whom were married at a young age, for up to 20 years—to examine impacts on a wide range of variables including educational attainment, labor force participation, participation in household decision-making, divorce-rates, maternal and child health. We use fixed effects estimation (the inclusion of geographic fixed effects at diminishing levels of aggregation and sister fixed effects models where possible) to move from associations towards causal estimates (while acknowledging that the estimates are unlikely to be entirely causal).

Our first contribution is to provide evidence of the differential experiences of girls who marry before the age of 18 compared to those who marry after that age in a cultural context where less evidence is available.[4] Second, we use data that covers a longer time frame than existing studies and hence allows an examination of different stages of women's lives. The data source is also especially rich and allows us to look at a wider range of outcomes than is normally possible. Third, we extend the literature by examining early marriage of boys. There is very limited research on the early marriage of boys, even though its prevalence internationally is estimated to average 4.5% (with a maximum approaching 30% in some places), Murray Gaston et al. (2019). A final contribution of the paper is that it compares outcomes for young girls who married young boys, and young girls who married older men.

In the next section we discuss the characteristics of the IFLS. Our empirical methodology is discussed in Section 3. Section 4 discusses the results with Section 5 drawing conclusions and policy implications.

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[4] A further difference between our study and others is that we examine outcomes associated with child marriage from comparisons of women who married right up to the age of 18 with those who married after 18. Using age of menarche as an instrumental variable (à la Field and Ambrus, 2008) provides a local average treatment effect and so identifies the effects of delaying marriage on girls aged between 12 and 14. This also limits the applicability of this method to cultural contexts where girls are married at this very early age. The studies that have exploited changes in marriage laws identify the effects of delaying marriage for girls aged 15 to 16 (who could previously be legally married).

2 Data

The Indonesia Family Life Survey is a longitudinal socioeconomic and health survey. The first wave of the survey was conducted in 1993 and provides information on around 30 000 individuals, covering provinces which are representative of about 83% of the Indonesian population. The data include a broad range of information on individual respondents, their families, their households, the communities in which they live, and the health and education facilities they use (Strauss et al. 2016).

The IFLS currently consists of five waves with surveys being conducted in 1993, 1997, 2000, 2007 and 2014. It collects information on the original households that were surveyed in 1993 and new households that are formed when members of the original households move out to form their own households. Approximately 87 per cent of IFLS1 households were re-interviewed across all survey waves.[5]

An additional survey—IFLS-East—was conducted in 2012 and surveyed 2547 households in Indonesia's eastern provinces, which were not represented in the original 1993 sample. We include these data in the analyses.

Our analysis sample consists of respondents who participated in the IFLS5 and IFLS-East rounds and were 18 or over at the time. We thus exclude observations from those who are not yet 18 and who may yet get married before they reach that age.[6] We also exclude those from earlier waves who are not observed in IFLS5 (often due to death) so as to be more representative of the current population. Where IFLS5 individuals participated in earlier waves, their earlier responses are used in analyses of life trajectories. The final cleaned dataset includes around 40,800 unique respondents.[7]

3 Methods

It is straightforward to demonstrate that early marriage is correlated with many important indicators of welfare, but the exact nature of the relationship is more difficult to prove because, as discussed above, many of the correlates of child marriage are associated with disadvantage more generally. For example, men and women who marry early have fathers with lower levels of education on average. People with parents with lower levels of education are also likely to have lower levels of education themselves, and education levels determine what kind of job people end up getting. It is then, for example, difficult to determine to what extent the underrepresentation of women who married early in waged jobs is a result of their marrying early, and to what extent it is related to them coming from less-educated backgrounds.

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[5] This 87% includes households who were not interviewed because all household members died.

[6] We define child marriage to be marriage under the age of 18 (in line with the international definition of childhood). Under Indonesian law, both men and women are not legally allowed to marry before the age of 19.

[7] This is the full sample of individuals in the IFLS5 and IFLS-East rounds who were 18 years or older. However, in the estimations the sample sizes are further restricted to observations with the full set of information for the dependent and control variables. Approximately 31,300 observations include the full set of variables. Appendix Fig. 2 shows the distribution of birth years in the final sample.

To get closer to estimating the causal effects of early marriage on the outcome variables, we use the IFLS waves as pooled cross-sections and use ordinary least squares (OLS) to estimate models with fixed effects for geographic region, down to village level. The general estimation specification we use is:

$$Y_{ihvt} = \alpha_1 + \alpha_2 Early\,Marriage_i + \gamma_2 X_{ihvt} + \gamma_3 HCh_h + \delta_{gt} + \varepsilon_{vt} \qquad (1)$$

where Y_{ihvt} represents outcomes of interest, e.g., education, labor force participation, health, decision-making and fertility, for individual i, in household h, in village v at time-wave t. $Early\,Marriage_i$ is an indicator variable for each individual that takes the value of 1 for those who were married before the age of 18 and 0 otherwise. X_{ihvt} are contemporaneous individual variables like age, religion and urban residence.[8] Including contemporaneous variables controls for current circumstances (e.g. age) that can influence the variable of interest, for example, older people having poorer health. HCh_{hvt} are time invariant characteristics of the household individuals grew up in, like years of education of the father and if the biological parents were married when the individual was 12. These variables control for early life investments that affect later outcomes, e.g. individuals with a father with low education are more likely to have lower education attainment or poorer health than otherwise similar individuals. The effect of early marriage on Y_{ihvt} will be captured by α_2

Differences between regions are accounted for by the fixed effects δ_{gt} which capture the differences between groups g at time-wave t. We specify two main groups - provinces and villages. The individuals in our sample span 20 provinces and over 1600 villages.[9] Including these fixed effects in the estimation controls for unobserved differences between, say, villages that influence the outcome variables. For example, access to formal employment may be lower in some villages than others. If more people who were married early live in such villages, then not controlling for which village the respondents live in will confound the effect of early marriage and the probability of having a formal job. We also interact those groups with the time the survey was conducted to account for differential time trends across provinces or villages. By using village fixed effects we are comparing individuals who marry early with those who do not but who live in the same village, and therefore are exposed to similar conditions, like traditions, culture and institutional settings. As people within a village are exposed to more similar conditions than people within a province, village fixed effects are likely to control more effectively for differences across individuals than province fixed effects. The inclusion of village fixed effects however comes at the cost of statistical power (as the coefficients are estimated off the more limited within-village variation).

If we explore the extent to which province and village fixed effects capture differences in social and economic disadvantage by examining their ability to explain variation in educational attainment, we find that the village fixed effects explain more

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[8] In robustness checks we included consumption per capita to control for the contemporaneous effect of current household characteristics. The results are largely unchanged. We exclude it from the results presented as it is potentially endogenous.

[9] There are 1631 communities (or enumeration areas) in our sample. The number of women per enumeration area in our sample varies from 1 to 76 with a median of 24 observations.

than 30% of this variation, considerably more than the 3% explained by province fixed effects. The majority of the variation is however within villages.

We first present estimations that control for province*time-wave FE and then village*time-wave FE. We then go a step further by presenting results where we estimate sister fixed effects models in which the coefficients are estimated off comparisons of sisters, one of whom got married early and the other who did not. This comparison controls for all family characteristics, both observable and unobservable, experienced by sisters e.g., family background. This however significantly reduces the sample. Within our sample there are 676 sisters, of whom 302 were married early. The women in the sisters sample (as they come from a family in which at least one girl is married early) have fathers with significantly lower educational attainment, are more likely to be Muslim, and are more likely to live in rural areas. These results are thus best read as being applicable to households from more conservative and lower socio-economic households. The sister fixed effects explain 65% of the variation in education in this sample.[10]

Finally, ε_{ihvt} is an error term. We cluster the standard errors at the village × time-wave level to account for correlation in the errors between individuals in the same village at a given time. For the sister fixed effects estimation we cluster the standard errors at the sister × time-wave level. We estimate Eq. 1 separately for men and women.[11]

For child-level outcomes we estimate Eq. (2).

$$ChY_{ihvt} = \alpha_1 + \alpha_2 Mother\text{'}s\ Early\ Marriage_i + \gamma_2 X_{ihvt} \\ + \gamma_3 MotherHCh_{hv} + \gamma_4 Ch_{ihvt} + \delta_{gt} + \varepsilon_{vt} \tag{2}$$

where ChY_{ihvt} are the child outcomes (medically supervised birth, having a birth certificate, infant mortality, anthropometric z-scores, underweight and stunting for children under the age of 5, cognitive development tests for those aged 7 to 14, educational attainment for those aged over 18). As in Eq. 1, we control for contemporaneous mother and household characteristics (X_{ihvt}), characteristics of the household in which the mother lived when she was 12 years old ($MotherHCh_{hv}$) and children's own characteristics such as gender and age (Ch_{ihvt}). We use an identical fixed effects strategy as in Eq. (1) and present province × time-wave, village × time-wave and, where possible, sisters × time-wave fixed effects results.

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[10] Note that there is no systematic relationship between birth order (which may be a determinant of some of the outcomes we examine) and child marriage in our sample. Girls may also be more likely to be married early in response to an economic shock. Thus, our estimates of the impact of child marriage may be conflated with the effect of economic shocks. Note however that our sample consists of women of many different ages, most of whom were married many years before the survey date at which the outcome variables are measured, reducing the probability that the outcomes we examine are affected by the economic situation at the time of marriage.

[11] For the fertility variables (total number of live births, still births and miscarriages) we include an additional individual-level variable—the number of years from onset of menstruation to the survey date—to account for the woman's exposure to pregnancy. This accounts for the fact that for older women (over 49) we observe total fertility while for young women we observe fertility up to that point.

4 Results

4.1 Descriptive statistics

Child marriage affects Indonesian women and men across all religions, ethnicities, regions and socioeconomic levels. From the IFLS data we estimate that around 23 per cent of women who were alive in Indonesia in 2012/2014 were married before the age of 18, and around one in 17 Indonesian men (5.9 per cent) were married under the age of 18.[12]

There is significant variation across provinces, ranging from around 8 per cent of women in Yogyakarta, to 35 per cent in Sulawesi Tenggara. The prevalence of child marriage is significantly higher for women than for men across all provinces. Six provinces have rates of male child marriage at or above 5 per cent, with the highest being 11%, also in Sulawesi Tenggara.[13] The prevalence of early marriage among both females and males is significantly greater in rural areas (28% female, 9% male) than in urban areas (17% female, 2.1% male). Collectively, these figures imply that about 20 million women and 5 million men in Indonesia today were married before they reached the age of 18 years.[14]

Child marriage occurs in all religious groups, with prevalence being highest among Muslims (25% compared to 22% for Protestants, 18% for Hindus and 16% for Catholics).

As discussed above, internationally child marriage is associated with lower socio-economic status. Our data indicate that Indonesia is no exception to this. Child marriage decreases with household per capita consumption in both urban and rural areas (with the exception of males in rural areas where it remains relatively constant), with the correlation being stronger in urban areas than in rural areas. In urban areas, a woman in the poorest consumption quartile is nearly twice as likely to have married early as a woman in the richest consumption quartile (a difference of 9 percentage points). By comparison, a woman in the poorest consumption quartile in a rural area is only around 13% (3 percentage points) more likely to be married early than her richest counterpart. A woman in the richest quartile in a rural area is however more likely to be married early than even a woman in the poorest quartile in an urban area.[15]

There is a stark difference in the educational attainment of those who were married at an early age compared with those who were not. Less than three out of every ten Indonesians who married early were still attending school at the age of 15, compared to more than six out of every ten who didn't marry early. By the age of 18, less than

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[12] These are weighted averages across the respective IFLS surveys. This is the rate across the entire population and so is not directly comparable to estimates reported in BPS (2016) which reports the rate of child marriage among those aged 20 to 24 in their data sources at the time of data collection.

[13] Sulawesi Tenggara (11%), Papua (7%), West Papua (8%), Maluku (6%), North Maluku (6%) and East Kalimantan (5%). For more detail see Table 8 in the appendix.

[14] These figures are calculated as the Indonesian population aged over 20 years in 2019, taken from World Bank (2020), multiplied by the prevalence of child marriage for women and men, respectively (22.6%; 5.9%).

[15] The relationship between child marriage and consumption is illustrated in Appendix Fig 3. Other descriptive statistics by child marriage status are presented in Appendix Table 9.
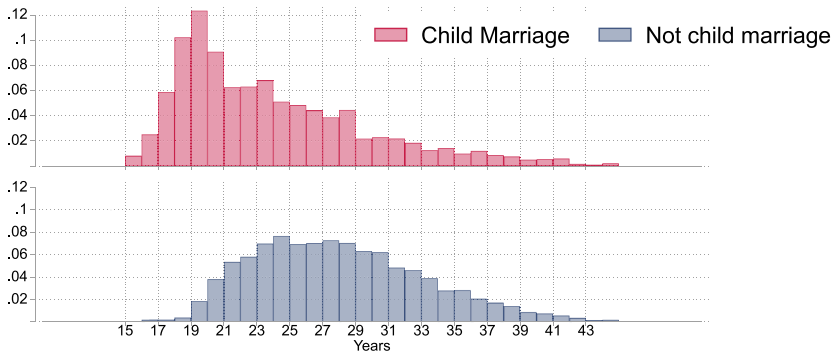
Fig. 1 Mother's age at the end of first pregnancy

3% of girls (7% of boys) who married early were still in education, compared to more than 30% for those who didn't marry early.[16]

Women who were married early have lower labor force participation. This may be due to having children at a younger age. Women and men who married early are also less likely to be formal sector (wage) workers and more likely to be self-employed or unpaid family workers. Such workers bear the brunt of income fluctuations and have limited access to healthcare, pension plans and paid leave.

Figure 1 shows the age of first birth for women who married early (at the top) and those who did not. The modal age of first birth of women who married early is 19, compared to 24 for those who did not. By the age of 21, around 40 per cent of women who married early had given birth, compared with less than seven per cent of women who did not marry early. Those who married early also have more children on average (2.3 versus 1.9). Only about fifty percent of women who were married early had a medically-supervised birth compared to seventy percent of women who were not married at an early age. Further, women who married early have fewer antenatal medical check-ups and are less likely to receive standard checks during their pregnancy, like blood tests or foetal heartbeat checks, that help prevent complications during pregnancy and delivery, or to take iron supplements to prevent anaemia.

A child born to a mother who married early was around 33 percent more likely to die before the age of five than other children. They were also more likely to be underweight and stunted (Appendix Figs. 2–6).[17]

4.2 Estimation results

We first discuss the estimation results for women then go on to discuss the results for men and the effect of girls marrying older men versus underaged girls and boys getting married.

[16] See Appendix Figure 4.

[17] See Appendix Figures 5 and 6.

4.2.1 Child marriage and women

Table 1 presents results for educational attainment and labor market outcomes.

Education Column 1 shows the unconditional association between educational attainment and early marriage. It shows that women who marry before the age of 18 obtain 3.4 years less education. Subsequent columns control for a range of variables. Column 2 controls for religion, paternal education (as a proxy for family socio-economic background), whether the woman's parents remained married when she was aged 12 (stability of family life), the age of the woman at the time she was surveyed, and whether she lived in an urban area at age 12 (as this can affect educational and other opportunities). Column 2 also includes province fixed effects. In Column 3 we include village fixed effects and in Column 4 sister fixed effects.[18] The sister fixed effects specification controls for all non-time-varying family characteristics and should theoretically produce the most reliable causal estimates. However, as the sample size is significantly reduced in these estimations, the statistical power is also reduced which limits our ability to detect statistically significant differences. The same sequence of results is presented for each of the outcome variables below, with the only difference being that for subsequent outcome variables we control for urban area at the time of the survey (rather than at age 12, which is only relevant for when education is being attained) and interact the district and province fixed effects with survey year (as the other outcome variables, such as labor force participation, vary across time and use multiple observations per individual).

All of the columns in Table 1 show that women who get married under the age of 18 have worse educational outcomes. As women who marry early are more likely to be Muslim and from families with lower levels of education, once we control for these factors we see that the coefficient on early marriage becomes smaller but remains strongly statistically significant. The results with village fixed effects suggest that early marriage results in women obtaining on average 1.7 years less education. The results identified from differences across sisters (Column 4) suggest a difference of 0.91 years (still strongly significant).

Employment Column 5 shows that women who married early are on average 2 percentage points less likely to be working. For labor force participation (LFP), in addition to the control variables discussed above, we include whether the woman is partnered and the number of children under the age of 5 as these are known to be important determinants of female LFP. We also control for age using dummy variables for age (rather than a single continuous variable) which allows us to pick up the variation of LFP across the lifecycle. The negative association between early marriage and LFP persists after adding these controls and with the inclusion of village fixed effects (Column 7). Column 8 allows the coefficient on child marriage to vary with urban/rural location as the labor market varies considerably between urban and rural areas. It shows that the negative association with early marriage is being driven by women who married early in urban areas working less (5 percentage points) than other women. There is no difference in rural areas. The results with the sister fixed

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[18] The sister fixed effects control for all non-time varying family characteristics, hence non-time varying household controls cannot be separately identified and are dropped.

Table 1 Effect of child marriage on education and labor market outcomes

Dependent Variable:	Educational Attainment (years)				Labor Force Participation				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Child marriage	−3.44*** (0.09)	−2.15*** (0.08)	−1.65*** (0.09)	−0.91*** (0.22)	−0.02*** (0.01)	−0.01** (0.01)	−0.02** (0.01)	0.01 (0.01)	0.09** (0.04)
Urban × Child marriage								−0.06*** (0.01)	−0.12** (0.06)
Urban Area		0.79*** (0.07)	0.27*** (0.07)	0.17 (0.45)					0.07 (0.06)
Muslim		−0.49*** (0.16)	−0.52*** (0.20)			−0.08*** (0.01)	−0.00 (0.02)	−0.001 (0.02)	
Age (years)		−0.10*** (0.004)	−0.12*** (0.004)	−0.16*** (0.03)		−0.07*** (0.01)			
Paternal education (years)		0.39*** (0.01)	0.29*** (0.01)			0.00 (0.00)	0.002*** (0.001)	0.002*** (0.001)	
Parents married (when age 12)		0.80*** (0.08)	0.72*** (0.09)			−0.00 (0.01)	−0.01 (0.01)	−0.01 (0.01)	
Additional LFP Controls:									
Number of children under 5						−0.08*** (0.004)	−0.07*** (0.004)	−0.07*** (0.004)	−0.08*** (0.02)
Partnered						−0.15*** (0.01)	−0.15*** (0.01)	−0.15*** (0.01)	−0.27*** (0.04)
Constant	9.82*** (0.09)	10.32*** (0.23)	11.78*** (0.26)	13.46*** (0.93)	0.65*** (0.004)	0.57*** (0.02)	0.45*** (0.02)	0.45*** (0.02)	0.71*** (0.13)
Fixed effects	-	Province	Village	Sisters	-	Province × Survey Wave	Village × Survey Wave	Village × Survey Wave	Sisters
Mean dep. var.	9.17	9.17	9.17	8.13	0.64	0.64	0.64	0.64	0.58
Observations	14,168	14,168	14,168	623	37,901	37,901	37,901	37,901	1612

	Formal Sector Employment					Log Hourly Wage			
	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
Child marriage	−0.20*** (0.01)	−0.13*** (0.01)	−0.11*** (0.01)	−0.09*** (0.01)	−0.12** (0.05)	−0.58*** (0.03)	−0.33*** (0.03)	−0.24*** (0.04)	−0.18*** (0.06)
Urban × Child marriage				−0.07*** (0.02)	−0.02 (0.08)				−0.12 (0.09)
Urban Area	0.16*** (0.01)				0.03 (0.10)	0.17*** (0.03)			
Muslim	0.01 (0.01)	−0.004 (0.02)	−0.004 (0.02)	−0.002 (0.02)		−0.32*** (0.05)	−0.32*** (0.05)	−0.18** (0.08)	−0.18** (0.08)
Age (years)	−0.01*** (0.00)	−0.01*** (0.00)	−0.01*** (0.00)	−0.01*** (0.00)	−0.01** (0.004)	0.02*** (0.001)	0.02*** (0.001)	0.02*** (0.001)	0.02*** (0.001)
Paternal education (years)	0.01*** (0.001)	0.01*** (0.001)	0.01*** (0.001)	0.01*** (0.001)		0.07*** (0.003)	0.07*** (0.003)	0.06*** (0.005)	0.06*** (0.005)

Table 1 continued

	Formal Sector Employment					Log Hourly Wage			
	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
Parents married (when age 12)		0.02*** (0.01)	0.02*** (0.01)	0.02*** (0.01)			0.14*** (0.03)	0.08* (0.05)	0.08* (0.05)
Additional LFP Controls:									
Number of children under 5									
Partnered									
Constant	0.39*** (0.01)	0.44*** (0.02)	0.53*** (0.03)	0.53*** (0.03)	0.61*** (0.14)	7.64*** (0.02)	6.64*** (0.09)	6.79*** (0.12)	6.79*** (0.12)
Fixed effects	–	Province × Survey Wave	Village × Survey Wave	Village × Survey Wave	Sisters	–	Province × Survey Wave	Village × Survey Wave	Village × Survey Wave
Mean dep. var.	0.34	0.34	0.34	0.34	0.32	7.54	7.54	7.54	7.54
Observations	24,653	24,653	24,653	24,653	781	9079	9079	9079	9079

Standard errors in parentheses. Standard errors are clustered at the village level except when sister fixed effects are included, when they are clustered at the family level. We do not present results for the sisters FE for log hourly wages as the sample size is too small. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$. Specifications in columns (5)–(9) also included dummy variables for age in years

effects reveal that in urban areas the sister who married early is 3 percentage points less likely to be working than her sister who didn't marry early but in rural areas she is 9 percentage points more likely to be working than her sister who married later. This may reflect that working on family farms in rural areas accommodates family responsibilities.

Table 1 also examines the probability of working in the formal sector. It shows that, of those women who work, early married women are 20 percentage points less likely to be working in the formal sector. This difference decreases to 11 percentage points with the addition of the full set of controls and village fixed effects but remains strongly significant (Column 12). Again, this association is larger in urban areas. Women who married early in rural areas are 9 percentage points less likely to work in the formal sector, compared to 16 percentage points less likely in urban areas. These differences are large. In the comparison across sisters, a sister who married early is 12 percentage points less likely to be working in the formal sector than her sister who was not married early (with no difference between rural and urban areas).

The last outcome variable examined in Table 1 is hourly earnings.[19] Of those women with positive earnings, women who married early earn on average 58% less than otherwise similar women. This is a very large and strongly significant result. It persists with the addition of villages fixed effects, suggesting a (still large) 24% lower hourly earnings. The point estimates in the last column suggest even larger hourly earnings differential in urban areas, but the difference between urban and rural areas is not statistically significant.

Household living standards Table 2 presents results for household per capita consumption, as a proxy for household living standards. Column 1 shows that on average women who married early live in households that have 18% lower per capita consumption. However, once we add the control variables and control for the location in which the woman resides, this impact diminishes to only 1% (and is statistically insignificant), Column 3. However, consistent with the greater labor market penalties faced by urban women who marry early, urban women who marry early live in household with 4% lower per capita consumption (Column 4). The results comparing sisters are similar, although statistically insignificant (Column 5).

Family structure and decision-making Panel A of Table 3 reports results examining whether the marriage was a civil marriage, i.e. whether the couple have a marriage certificate. Women who married under the age of 18 are about 2 percentage points less likely to have a marriage certificate after controls and village fixed effects have been included, Column 3. The point estimate remains the same magnitude but becomes insignificant once sister fixed effects are included in Column 4. Below, when looking at children's outcomes, we show that early marriage is associated with a decrease in the probability of the children from the marriage having a birth certificate (Table 5). Not having these certificates can make it difficult for women, their children and their household to access social protection programs, and in some instances, for children to attend school. Not having a marriage certificate also limits the ability of women to seek legal redress in the case of divorce.

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[19] We do not report sister fixed effects results here as the sample is too small.

Table 2 Effect of Child marriage on Log Per Capita Consumption

Dependent Variable:	Log Per Capita Consumption				
	(1)	(2)	(3)	(4)	(5)
Child Marriage (u18)	−0.18*** (0.01)	−0.03*** (0.01)	−0.01 (0.01)	0.01 (0.01)	0.03 (0.05)
Urban × Child marriage				−0.04** (0.02)	−0.03 (0.08)
Urban		0.20*** (0.01)			0.35*** (0.08)
Muslim		−0.08*** (0.02)	−0.07*** (0.03)	−0.07*** (0.03)	
Age (years)		0.002*** (0.00)	0.003*** (0.00)	0.003*** (0.00)	0.001 (0.01)
Paternal education (years)		0.05*** (0.001)	0.04*** (0.001)	0.04*** (0.001)	
Parents married (when age 12)		0.07*** (0.01)	0.04*** (0.01)	0.04*** (0.01)	
Constant	15.03*** (0.01)	14.59*** (0.03)	14.73*** (0.03)	14.72*** (0.03)	12.57*** (0.21)
Fixed effects	–	Province × Survey Wave	Village × Survey Wave	Village × Survey Wave	Sisters
Mean dep. var.	15.0	15.0	15.0	15.0	15.1
Observations	37,901	37,901	37,901	37,901	1612

Standard errors in parentheses. Standard errors are clustered at the village level in Columns (1)-(3) and at the family level in column (4). ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

Table 3 Effect of child marriage on family structure and decision-making

	(1)	(2)	(3)	(4)
A. Dependent Variable: Has marriage certificate				
Child marriage	−0.08*** (0.01)	−0.06*** (0.01)	−0.02** (0.01)	−0.02 (0.03)
Fixed effects	–	Province	Village	Sisters
Mean dep. var.	0.89	0.89	0.89	0.89
Observations	11,183	11,183	11,183	651
B. Dependent Variable: First marriage ended in divorce				
Child marriage	0.04*** (0.01)	0.04*** (0.01)	0.03*** (0.01)	0.003 (0.03)
Fixed effects	–	Province	Village	Sisters
Mean dep. var.	0.05	0.05	0.05	0.05
Observations	7076	7076	7076	343
C. Dependent Variable: Decision-making Index				
Child marriage	−0.21*** (0.02)	−0.12*** (0.02)	−0.10*** (0.02)	−0.14 (0.09)
Fixed effects	–	Province × Survey Wave	Village × Survey Wave	Sisters
Mean dep. var.	3.6	3.6	3.6	3.3
Observations	25,140	25,140	25140	1154

Standard errors in parentheses. Standard errors are clustered at the village level in Columns (1)–(3) and at the family level in column (4). ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$. Specifications in Columns (2)–(4) also included controls for Islamic religion, age, paternal education and whether parents were married when respondent was aged 12. Controls for urban locations were also included in Column (2). Column (4) only included controls for urban location and age

Panel B of Table 3 examines the divorce rate in first marriages. It shows that marriages involving a woman under the age of 18 are about 3 percentage points more likely to result in divorce (Column 3). This is a 60% increase. The point estimate is reduced to zero and becomes insignificant with the inclusion of sister fixed effects. This likely reflects the very small sample. If we expand the sample by defining women who married under the age of 19 as marrying early, the estimate remains at 3 percentage points and is significant at the 5% level.[20]

Within the household, women who married early are significantly less likely to have a say in household-decisions (Panel C).[21] Early marriage is thus associated with a decrease in women's empowerment. In unreported results, we examine different types of decision-making. The result is being driven by these women having a lesser say in decisions about household savings, use of contraception and whether they work or not. Again, the point estimate is a similar magnitude in the sister fixed effects specification but statistically insignificant.

[20] Expanding the sample of sisters in this way increases it to 1250 sisters of whom 627 married early. Results available on request.

[21] The IFLS asks respondents aged over 15 how their family makes decisions about expenditures and use of time. Where women report they have a say, it does not mean they are the only decision maker. The survey allows for the respondent to report that they, their spouse, son, daughter, mother, father, mother-in-law, father-in-law, brother, sister, brother-in-law, sister-in-law, grandparent, son/daughter in-law and/or grandchild each contribute to the decision-making process.

Fertility, childbirth and child mortality   Child marriage is associated with the age at first birth being more than 2 years earlier and in women having somewhere between 0.3 and 0.45 more children on average (Table 4, Panels A and B). The IFLS provides a rich array of data on antenatal care. Panels C to H with village fixed effects show that women who marry early and become pregnant are less likely to take iron supplements during pregnancy and are less likely to have had foetal heartbeat and length checked, to have had a blood test and to have had their weight monitored during pregnancy. This places them at heightened risk of an adverse outcome.[22] Child marriage, other things equal, is also associated with a significantly lower probability of the woman having a medically supervised birth (Panel I). We are unable to assess the association with maternal mortality as there are too few observations in the data, however the existing literature finds that giving birth at a young age and not having a medically supervised birth is associated with a heightened risk of maternal mortality, Nour (2006) and Cameron et al. (2019).[23]

The results for infant and child mortality in Table 4, Column 2 (with province fixed effects) suggest that early marriage increases the probability of a child dying before the age of one by about 1 percentage point (Panel J). This is a 20% increase on the mean across the sample of 0.05. Under 5 mortality increases by the same amount (Panel K). These results do not hold, however, once village fixed effects are included. This likely reflects the small number of infant and child deaths recorded in the data as if we increase the sample size by defining child marriage to be under the age of 19 (in line with Indonesian law), the coefficients remain the same magnitude (0.01) and are significant (at the 5% level for infant mortality and 10% level for child mortality). Results available on request.

Women's health and wellbeing   Respondents are asked about their current standard of living, food consumption, healthcare, and general happiness; and their children's standard of living, food consumption, healthcare, and education. We constructed a standardized index from these responses. Panel L in Table 4 shows that women who married early are significantly less satisfied with their lives. Their subjective well-being index is close to a whole standard deviation lower than similar women who married at a later age.

IFLS respondents are also asked to rate their general health and asked a series of questions designed to assess mental health. We find no systematic differences on these health indicators, Appendix Table 10.

Child health and education   Panel A of Table 5 shows that, as was discussed above, early marriage results in children being less likely to have a birth certificate.[24] This is likely to hinder their access to publicly provided services.

Panel B examines children's vaccination status. Early marriage is associated with significant reductions in the probability of children receiving at least one dose of each of the five vaccines on the full vaccination schedule.[25]

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[22] The sister fixed effects results are similar in magnitude but insignificant.

[23] We find no effect on the number of miscarriages and still-births. Results available on request.

[24] We do not estimate models with sister fixed effects here because sample sizes become very small.

[25] The full vaccination schedule is defined as at least one dose each of the polio, DPT, Hep B, measles and rotavirus vaccines.

Table 4 Fertility, Childbirth, Child Mortality and Wellbeing

	(1)	(2)	(3)	(4)
A. Dependent Variable: Age at first birth				
Child marriage	−4.18*** (0.19)	−3.00*** (0.17)	−2.92*** (0.22)	−2.50*** (0.72)
Mean dep. var.	26.8	26.8	26.8	24.9
Observations	7076	7076	7076	343
B. Dependent Variable: Number of Live Births				
Child marriage	0.44*** (0.37)	0.45*** (0.04)	0.45*** (0.04)	0.34*** (0.11)
Mean dep. var.	2.0	2.0	2.0	1.7
Observations	7065	7065	7065	343
C. Dependent Variable: Number of Pregnancy Check-up Visits				
Child marriage	−0.55*** (0.13)	−0.12 (0.13)	−0.02 (0.17)	−0.54 (0.55)
Mean dep. var.	9.2	9.2	9.2	8.4
D. Dependent Variable: Took iron supplement during pregnancy				
Child marriage	−0.06*** (0.01)	−0.05*** (0.01)	−0.05** (0.01)	−0.06 (0.05)
Mean dep. var.	0.87	0.87	0.87	0.80
E. Dependent Variable: Foetal heartbeat checked during pregnancy				
Child marriage	−0.06*** (0.01)	−0.04*** (0.01)	−0.04** (0.02)	−0.012 (0.05)
Mean dep. var.	0.87	0.87	0.87	0.84
F. Dependent Variable: Foetal length checked during pregnancy				
Child marriage	−0.04*** (0.02)	−0.03** (0.01)	−0.03 (0.02)	−0.06 (0.06)
Mean dep. var.	0.56	0.56	0.56	0.53
G. Dependent Variable: Had a blood test during pregnancy				
Child marriage	−0.04*** (0.01)	−0.03*** (0.01)	−0.03*** (0.01)	−0.02 (0.03)
Mean dep. var.	0.95	0.95	0.95	0.95
H. Dependent Variable: Mother weighed during pregnancy				
Child marriage	−0.04*** (0.01)	−0.03*** (0.01)	−0.03** (0.01)	−0.06 (0.04)
Mean dep. var	0.92	0.92	0.92	0.87
Observations	10,217	10,217	10,217	466
Fixed effects	–	Province × Survey Wave	Village × Survey Wave	Sisters
I. Dependent Variable: Medically-supervised birth				
Child marriage	−0.17*** (0.01)	−0.07*** (0.01)	−0.04*** (0.02)	−0.11** (0.06)
Mean dep. var.	0.66	0.660	0.660	0.57
Observations	10,217	10,217	10,217	466
J. Dependent Variable: Under 1 Child Mortality				
Child marriage	0.01*** (0.004)	0.01** (0.004)	0.002 (0.004)	
Mean dep. var.	0.05	0.05	0.05	
Observations	26,247	26,247	26,247	
K. Dependent Variable: Under 5 Child Mortality				
Child marriage	0.01*** (0.004)	0.01 (0.004)	0.001 (0.005)	
Mean dep. var.	0.06	0.06	0.06	
Observations	26,247	26,247	26,247	
L. Dependent Variable: Subjective wellbeing index (standardized)				
Child marriage	−1.06*** (0.13)	−0.74*** (0.15)	−0.66*** (0.17)	−0.80* (0.49)
Mean dep. var.	0.00	0.00	0.00	−0.52
Observations	12,960	12,960	12,960	910
Fixed effects	–	Province × Survey Wave	Village × Survey Wave	Sisters

Standard errors in parentheses. Standard errors are clustered at the village level in Columns (1)–(3) and at the family level in column (4). ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$. Specifications in Columns (2) to (4) also included controls for Islamic religion, age, paternal education and whether parents were married when respondent was aged 12. Panels K and L also include a control for years of potential fertility. Controls for urban locations were also included in Column (2). Column (4) only included controls for urban location and age

Table 5 Child health, cognitive ability and education

	(1)	(2)	(3)
A. Dependent Variable: Has birth certificate (0 to 18 years old)			
Child marriage (mum)	−0.27*** (0.01)	−0.15*** (0.01)	−0.12*** (0.01)
Mean dep. var.	0.495	0.495	0.495
Observations	12,626	12,626	12,626
Fixed effects	–	Province × Survey Wave	Village × Survey Wave
B. Dependent Variable: Vaccinated against everything			
Child marriage (mum)	−0.08*** (0.01)	−0.07*** (0.01)	−0.05*** (0.01)
Mean dep. var.	0.77	0.77	0.77
Observations	9343	9343	9343
Fixed effects	–	Province	Village
C. Dependent Variable: Weight-for-age z-scores			
Child marriage (mum)	−0.15*** (0.03)	−0.07** (0.03)	−0.07* (0.04)
Mean dep. var.	−0.911	−0.911	−0.911
Observations	11,307	11,307	11,307
D. Dependent Variable: Underweight			
Child marriage (mum)	0.04*** (0.01)	0.02** (0.01)	0.02 (0.01)
Mean dep. var.	0.185	0.185	0.185
Observations	11,307	11,307	11,307
E. Dependent Variable: Height-for-age z-scores			
Child marriage (mum)	−0.22*** (0.03)	−0.14*** (0.03)	−0.12*** (0.04)
Mean dep. var.	−1.207	−1.207	−1.207
Observations	11,307	11,307	11,307
F. Dependent Variable: Stunting			
Child marriage (mum)	0.08*** (0.01)	0.06*** (0.01)	0.05*** (0.02)
Mean dep. var.	0.317	0.317	0.317
Observations	11,307	11,307	11,307
G. Dependent Variable: Ravens test results (standardized, 7−14 years old)			
Child marriage (mum)	−0.18*** (0.04)	−0.13*** (0.04)	−0.13*** (0.04)
Mean dep. var.	0.00	0.00	0.00
Observations	5633	5633	5633
Fixed effects	–	Province × Survey Wave	Village × Survey Wave
H. Dependent Variable: Children's Years of education (aged 18+)			
Child marriage (mum)	−1.06*** (0.09)	−0.45*** (0.09)	−0.17* (0.10)
Mean dep. var.	10.51	10.51	10.51
Observations	9184	9184	9184
Fixed effects	–	Province	Village

Standard errors in parentheses. Standard errors are clustered at the village level in Columns (1)–(3). ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$. Specifications in Columns (2) and (3) also included controls for Islamic religion, gender of the child, age of the child, maternal grandfather's education and whether the maternal grandparents were married when mother was aged 12. Controls for urban locations were also included in Column (2)

Children of child marriages weigh less at any age (Panel C, Table 5), however once village effects are included, the association becomes insignificant (Panel D). The relationship between child marriage and stunting however, remains significant. Children of women who married early are shorter for their age and the risk of stunting increases by about 5 percentage points (16%), Panel F.

Children of women who marry at an early age also perform worse in cognitive tests (scoring 0.13 standard deviations less than other children), Panel G. These results are from Raven's tests which measure general cognitive ability by testing pattern recognition in matrices that become more difficult as the test progresses. The test is designed to identify cognitive ability that is unaffected by educational attainment. Cognitive ability however affects education as individuals with higher cognitive ability do better at school and so are more likely to progress to higher levels of education (Raven and Raven, 2003).

Panel H shows a small but significant negative association with educational attainment of children (about a fifth of a year of schooling), Panel H, Column 3. In unreported results we separately examine estimates for boys and girls and find them to be of a similar magnitude.

As we showed above, child marriage is often associated with giving birth at an early age. Thirty-two percent of women who were married under the age of 18 had a child by the time they were 20, compared to only 2% of women who were not married under the age of 18. In unreported results we explicitly examine the role of young maternal age by including an indicator of having given birth before the age of twenty as an additional regressor in the specifications with village fixed effects. Inclusion of the control for young maternal age at the time of the birth does not substantively affect the magnitude and statistical significance of the coefficients on child marriage.[26] Results available upon request.

4.2.2 Child marriage and men

We now examine the experience of men who marry at an early age.

Education Table 6 shows that, like women, men who marry early obtain significantly less education than other men. The results are strongly statistically significant and similar in magnitude to those for women. The raw difference of almost 4 years is reduced to 2 years once we include the full set of controls.

Employment While women's labor force participation decreased in urban areas with early marriage, men who marry early have slightly higher labor force participation. The raw difference is 3 percentage points. Once we account for these men coming from families with lower levels of education etc., the impact becomes small and insignificant. There is no difference in this relationship between urban and rural areas (results available on request).

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[26] The only exception being children's education, where the inclusion of maternal age at birth is insignificant but its inclusion causes the coefficient on child marriage to also become insignificant. Giving birth under the age of twenty is strongly associated with lesser maternal educational attainment, having more children, a lower probability of having a medically-supervised birth and significantly higher infant and child mortality.

Table 6 Impacts of child marriage for men

	(1)	(2)	(3)
A. Dependent Variable: Educational Attainment (years)			
Child marriage	−3.71*** (0.20)	−2.43*** (0.19)	−2.00*** (0.21)
Mean dep. var.	9.7	9.7	9.7
Observations	12,192	12,192	12,192
Fixed effects	–	Province	Village
B. Dependent Variable: Labor Force Participation			
Child marriage	0.03*** (0.004)	0.01 (0.004)	0.004 (0.05)
Mean dep. var.	0.95	0.95	0.95
Observations	30,222	30,222	30,222
C. Dependent Variable: Formal Sector			
Child marriage	−0.19*** (0.01)	−0.10*** (0.01)	−0.08*** (0.01)
Mean dep. var.	0.453	0.453	0.453
Observations	29,664	29,664	29,664
D. Dependent Variable: Log hourly wages			
Child marriage	−0.42*** (0.05)	−0.34*** (0.05)	−0.21*** (0.07)
Mean dep. var.	7.726	7.726	7.726
Observations	15,014	15,014	15,014
E. Dependent Variable: Log Per Capita Consumption			
Child marriage	−0.22*** (0.02)	−0.08*** (0.02)	−0.07*** (0.02)
Mean dep. var.	15.09	15.09	15.09
Observations	30,222	30,222	30,222
F. Dependent Variable: First marriage ended in divorce			
Child marriage	0.06*** (0.02)	0.05*** (0.02)	0.05*** (0.02)
Mean dep. var.	0.03	0.03	0.03
Observations	12,242	12,242	12,242
G. Dependent Variable: Decision-making Index (0−5)			
Child marriage	−0.13*** (0.04)	−0.07* (0.04)	−0.04 (0.04)
Mean dep. var.	3.32	3.32	3.32
Observations	21,502	21,502	21,502
H. Dependent Variable: Subjective wellbeing index (standardized)			
Child marriage	−1.32*** (0.33)	−1.00*** (0.31)	−0.80** (0.40)
Mean dep. var.	0.00	0.00	0.00
Observations	9925	9925	9925
Fixed effects	–	Province × Survey Wave	Village × Survey Wave

Standard errors in parentheses. Standard errors are clustered at the village level. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$. All specifications include the same controls as in the specifications above for women

Panel C shows that men who marry early have a lower probability of working in the formal sector by around 8 percentage point (18%), once other factors are controlled for. Their hourly earnings are also a lot lower (Panel D). After including all controls, men who married early earn 21% less per hour than other men. This is a

large earnings penalty and similar to the 24% penalty experienced by women. Like women, there is a greater penalty in terms of obtaining formal sector work for men who marry early in urban areas (results not reported in the table).

Household living standards Men who married early live in households with about 7% lower per capita consumption than otherwise similar men. This is a bigger drop in consumption than for women (which was insignificant over the whole sample and 4% in urban areas) and likely reflects men's role as the primary income earner.

Family structure and decision-making Like women who marry early, men who marry early are more likely to experience divorce (5 percentage points, an increase of more than 100%).

Panel G of Table 6 shows that men who marry early report a lesser say in household decision-making than men who married at a later age. This could be because there is a lesser age difference between them and their wives.

Health and Wellbeing Like women who married early, men who married early report significantly lower levels of wellbeing. The difference in wellbeing between men who marry early and other men is large and similar to that experienced by women who marry early (approximately one standard deviation). The results for self-assessed health suggest a negative association. The sign for mental health is also negative but insignificant (Appendix Table 10).

4.2.3 Different types of child marriage

Across the world there are different reasons why parents marry off their children at young ages. We investigate the two most prevalent cases why parents marry their daughters in Indonesia. The first is the case where young girls are married to older men (males over 18 at the time of marriage), often for economic reasons as these men are able to financially provide for the girl and reduce the economic burden on the girl's family. The second case involves parents pressuring young couples to marry to avoid the social stigma associated with extramarital adolescent sex. Table 7 examines whether these different types of early marriage are associated with different experiences. In these specifications we include an indicator of whether both the husband and the wife were under 18 years of age at the time of their marriage. The coefficient on this variable (both spouses married early) captures any additional difference (relative to women who didn't marry early) associated with the husband also being under the marriageable-age.

Women who marry early and marry a similarly aged boy are even less likely to be working than other women who married early, although just as likely to be in the informal sector and with similar hourly earnings if they are working. Their per capita household consumption is, not surprisingly, lower (by 8%) if they marry a boy rather than an older man. They are even more unlikely to have a marriage certificate (by 7 percentage points), with all of the potential negative consequences described above. They are significantly less likely to divorce, however, if they marry someone their

Table 7 Effect of child marriage for women by "Type of marriage"

Dependent Variable:	Education (Years)	Labor Force Participation	Formal Sector	Log hourly earnings
Child Marriage	−1.60*** (0.10)	0.02* (0.01)	−0.11*** (0.01)	−0.23*** (0.06)
Both spouses married early	−0.22 (0.25)	−0.03* (0.02)	0.02 (0.02)	−0.05 (0.16)
Fixed Effects	Village	Village × Survey Wave	Village × Survey Wave	Village × Survey Wave
Mean Dep Var.	8.99	0.626	0.30	7.50
Observations	10,165	28,201	17,974	5899

Dependent Variable:	Log per cap. Cons.	Marriage certificate	Divorce	Decision-making Index
Child Marriage	−0.01 (0.01)	−0.02* (0.01)	0.01 (0.01)	−0.10*** (0.02)
Both spouses married early	−0.08*** (0.03)	−0.07** (0.04)	−0.04*** (0.01)	−0.10* (0.05)
Fixed Effects	Village × Survey Wave	Village	Village	Village × Survey Wave
Mean Dep Var.	14.94	0.91	0.015	3.555
Observations	28,201	9096	6057	22,001

Dependent Variable:	Age at First Birth	No. of live births	Subjective wellbeing index
Child Marriage	−2.82*** (0.24)	0.43*** (0.05)	−0.68*** (0.16)
Both spouses married early	−0.71 (0.59)	0.14 (0.14)	−0.11 (0.45)
Fixed Effects	Village	Village	Village × Survey Wave
Mean Dep Var.	26.8	2.00	0.08
Observations	6057	6047	11,258

own age (by 4 percentage points). There is no differential association with the other fertility-related outcomes and most health outcomes (results not presented).[27] In terms of their overall well-being, the coefficient on "both spouses marry early" is large and negative but statistically insignificant.

5 Conclusions and policy implications

Child marriage is associated with significantly worse outcomes for both women and men, and their children. These outcomes include lesser educational attainment (for both men and women), women in urban areas being less likely to work, both men and women being employed in lower-earnings jobs and lower per capita consumption. Women working is often associated with greater female empowerment and women who marry early also report having less say in household decision-making. Overall wellbeing also suffers.

Child marriage is also associated with very different experiences of pregnancy and childbirth and worse child health. Women who marry early have their first child more than two years earlier than other women. This results in them having more pregnancies and children. Early pregnancies are known to be associated with a higher probability of maternal mortality. Child marriage is associated with fewer antenatal checks, a lesser likelihood of the woman having a medically-supervised birth and a greater probability of her child dying before the age of 1. Those children who do survive are more likely to be stunted (low height-for-age) which is known to be associated with lower cognitive ability and other health problems later in life. Both sons and daughters of women who married at an early age score worse on cognitive tests than other children.

Marriages that involve young girls marrying young boys (often as a result of parental pressure) are associated with additional burdens as the couple struggles to support a young family with low educational attainment of both spouses. These marriages are however less likely to end up in divorce than marriages between a young girl and an older man.

The evidence presented above, alongside that of the several other studies cited in Section 1 which examine child marriage using empirical techniques designed to get closer to causal estimation (natural experiments, instrumental variables, matching and difference-in-difference models) and from qualitative studies (for example, see Djamilah, 2014) that document the negative experiences of those who married early builds a strong case for policies that deter child marriage.

Legislation increasing the legal age of marriage for women is a natural place to start in order to avoid the negative experiences associated with child marriage. Research however shows that the effects of changes in the legal minimum age of marriage are not as straightforward as one might think. Families may choose not to comply with such laws (for example, by "marrying" without a civil ceremony), with this being particularly likely if households have difficulty coping in times of economic hardship (Corno and Voena, 2016) or in places/ethnic groups where social norms and preferences for child marriage are strong (McGavock, 2021). In Indonesia, for example, the common practice of marrying girls under religious law, and not civil law, lessens the scope for changing the legal marriage age to affect the behavior of those who are strongly attached to tradition and social norms. Two studies in Mexico which used the differential timing of

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[27] The sample size was too small to examine children's outcomes.

the imposition of minimum marriageable age laws to estimate the effect of law reform on child marriage, adolescent fertility and school attendance found that although child marriage rates decreased in states that adopted minimum age laws, there was no decrease in overall teenage birth rates nor an increase in girls' school attendance, (Bellés-Obrero and Lombardi, 2020; Au Yong Lyn, 2019). Instead, the rates of informal unions increased, which in the long term could have even worse effects on women's health and the health of their children. While the studies of the effect of the increase in the legal age of marriage in Ethiopia consistently show that it caused delays in marriages (McGavock, 2021; Garcia-Hombrados, 2022; and Rokicki, 2021), results for its effect on other outcomes was mixed.

In addition to outlawing child marriage, governments can take a range of actions to encourage parents to marry their children at a later age. For example, reducing the parental cost of education (by reducing direct school costs or increasing families' ability to access education through school construction and increased educational supply) can not only encourage parents to keep their children in school but also to delay the age of children's marriage. Education – formal, vocational training and/or the teaching of life skills—also has the potential to empower girls to make more informed decisions over their future, including sex, reproduction and marriage, Bandiera et al. (2020).

Providing economic incentives to families, conditional on the postponement of the marriage of their daughters until after the legal minimum age, can potentially delay the age of marriage. In Bangladesh (where 74% of the women aged 20–49 are married by the age of 18), providing financial incentives in the form of free cooking oil to unmarried 15 year old girls if they remain single until the age of 18 reduced the probability of child marriage by 24%, reduced the probability of teenage childbearing by 11%, and resulted in recipients being 25% more likely to be enrolled in education at the age of 22–25, Buchmann et al. (2018).[28] In Malawi, a conditional cash transfer that targeted young women and provided incentives for girls to stay in school (payment of school fees and cash transfers) led to significant declines in early marriage. An important characteristic of the transfer was that a component (on average 30%) was paid directly to the girls, with the remainder being paid to their parents, Baird et al (2010). This differentiates it from the many conditional cash transfers operating around the world which incentivize keeping children in school and have been shown to have little impact on child marriage (for example, see Cahyadi et al., 2020). Other interventions, like constructions of schools or jobs opportunities can potentially have a positive effect, but limited evidence is available (for a literature review on interventions that potentially can delay marriage see Bergstrom and Ozler, 2021).

While economic conditions and education costs play a role in parents' decisions as to whether to marry their children early or not, child marriage is also in large part a cultural phenomenon with families often following the dominant social norm in their communities. Social norms evolve over time in response to changes in economic costs and benefits but they can also be influenced by information campaigns that raise awareness about a specific cultural norm and its consequences and cause people to question that tradition. Such information campaigns can be carried out in a wide

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[28] One might expect that a cash transfer conditional on school enrolment may have the same effect. Although these programs have been widely shown to increase educational attainment, there seems not to be a systematic effect on the age of marriage, Amin et al. (2016).

range of media – print, TV, radio and social media. Governments have a central role to play in any such campaign. The involvement of traditional leaders, particularly female leaders can be a powerful voice for change, Muriaas et al. (2019).

Most obviously, providing boys and girls with information and access to family planning options is a vital component to any government policy seeking to reduce early pregnancy and the consequent early marriages.

Finally, in addition to trying to reduce the prevalence of child marriage, governments can develop policies to reduce the negative impacts of child marriage. In Indonesia, schools across the country routinely refuse to allow married girls and (sometimes) boys to attend school. Allowing married children to attend school could reduce the negative educational impact of early marriage and programs that provide additional support to students with children (such as childcare) have been found to be successful in other contexts, Crean et al. (2001). Policies that encourage young mothers to attend antenatal check-ups and access a medically-supervised birth would also reduce the negative impact associated with early marriage and support young mothers-to-be to advocate for such medical care and counter the traditional views of childbirth which may exist within their household. Bureaucratic changes that make it easier for those who marry early to obtain marriage certificates (once they reach the legal marriageable age) and birth certificates for their children may also increase these families' ability to access education, social protection and other programs that can improve their welfare.

Governments have a range of tools at their disposal to reduce the prevalence of child marriage and to ameliorate its consequences. Legislating against child marriage is a good start but needs to be complemented by an array of other supporting policies that recognize the economic role of marriage and the crucial role of cultural norms. Greater community awareness of the economic, social and emotional costs of child marriage is a key and necessary component of any concerted effort to change cultural norms around marriage for the benefit of individuals, families and society.

Compliance with ethical standards

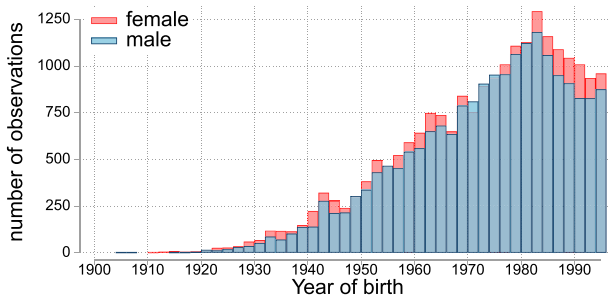# 6 Appendix

Figures 2–6

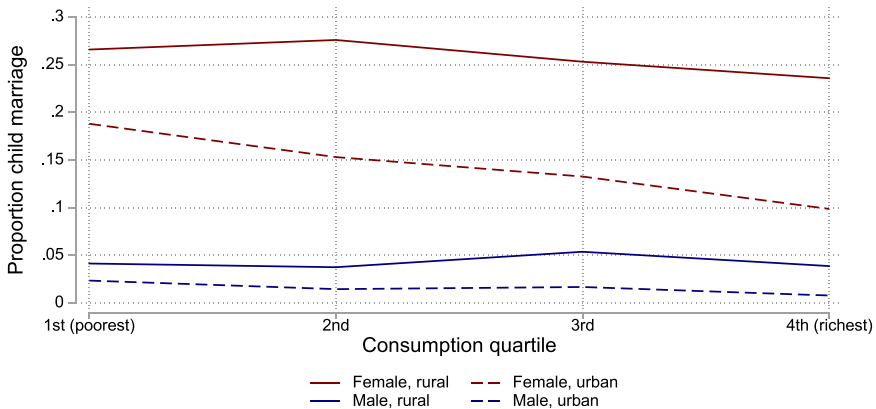**Fig. 2** Final sample, by year of birth

Fig. 3 Percentage child marriage, by consumption quartile
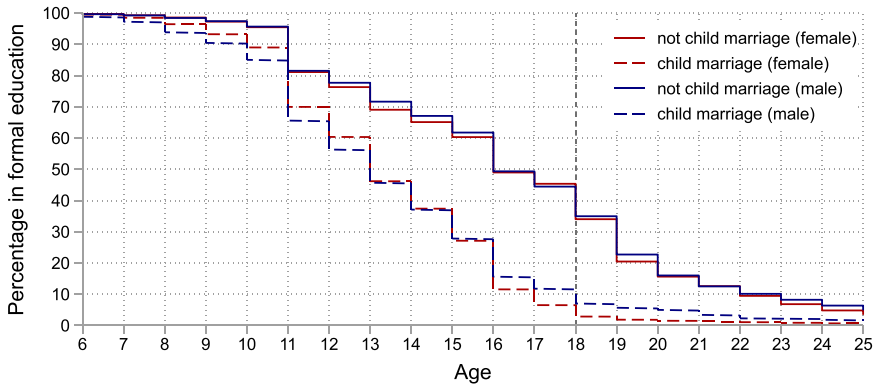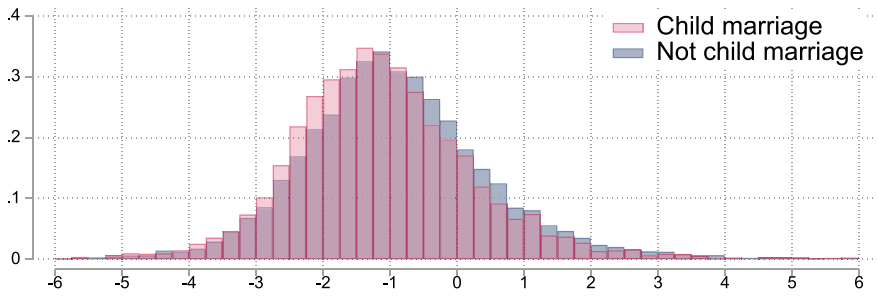
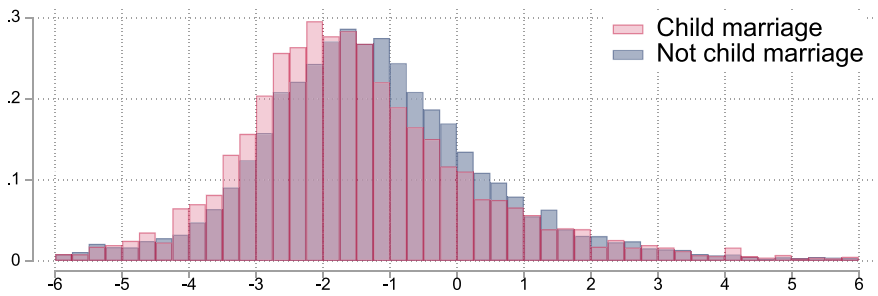**Fig. 4** Probability of being in school

Fig. 5 Weight for age Z-score

Fig. 6 Height for age Z-score

Tables 8–10

Table 8 Prevalence of child marriage, by IFLS province

	Female	Male
DI Yogyakarta	0.08	0.01
North Sumatra	0.10	0.02
Bali	0.11	0.02
West Sumatra	0.11	0.01
DKI Jakarta	0.13	0.01
West Nusa Tenggara	0.15	0.04
East Nusa Tenggara	0.16	0.04
Central Java	0.17	0.02
South Sulawesi	0.17	0.03
Maluku	0.19	0.06
North Maluku	0.20	0.06
South Sumatra	0.20	0.04
East Java	0.21	0.03
West Java	0.22	0.02
East Kalimantan	0.24	0.05
Lampung	0.26	0.02
South Kalimantan	0.26	0.04
West Papua	0.29	0.08
Papua	0.30	0.07
Sulawesi Tenggara	0.35	0.11

Table 9 a Descriptive statistics (women). b: descriptive statistics (men)

	(1)			(2)			(3)		
	Not married early			Married early			Total		
	mean	sd	count	mean	sd	count	mean	sd	count
(a)									
Educational attainment (years)	9.82	(4.18)	11481	6.38	(3.20)	2687	9.17	(4.24)	14168
Labor Force Participation	0.65	(0.48)	27939	0.61	(0.49)	9962	0.64	(0.48)	37901
Formal Sector Employment	0.39	(0.49)	18431	0.19	(0.39)	6222	0.34	(0.47)	24653
Log hourly wage	7.74	(2.39)	7617	6.50	(2.98)	1462	7.54	(2.54)	9079
Log per capita consumption	15.12	(1.28)	27939	14.59	(1.28)	9962	14.98	(1.30)	37901
Has marriage certificate	0.91	(0.29)	8795	0.82	(0.38)	2388	0.89	(0.32)	11183
First marriage ended in divorce	0.04	(0.19)	5653	0.08	(0.26)	1423	0.05	(0.21)	7076
Decision-making index	3.59	(1.20)	18309	3.37	(1.18)	6853	3.53	(1.20)	25140
Age at first birth	27.70	(5.21)	5653	23.42	(5.93)	1423	26.83	(5.63)	7076
Number of live births	1.94	(1.15)	5653	2.29	(1.51)	1423	2.01	(1.23)	7076
Number of pregnancy check-up visits	9.26	(4.18)	8278	8.69	(4.47)	1939	9.16	(4.25)	10217
Took iron supplement during pregnancy	0.88	(0.33)	8278	0.82	(0.39)	1939	0.87	(0.34)	10217

Table 9 continued

	(1)			(2)			(3)		
	Not married early			Married early			Total		
	mean	sd	count	mean	sd	count	mean	sd	count
Foetal height checked during pregnancy	0.57	(0.50)	8278	0.51	(0.50)	1939	0.56	(0.50)	10217
Foetal heartbeat checked in pregnancy	0.88	(0.32)	8278	0.83	(0.38)	1939	0.87	(0.33)	10217
Had a blood test during pregnancy	0.96	(0.20)	8278	0.92	(0.27)	1939	0.95	(0.21)	10217
Mother weighed during pregnancy	0.93	(0.26)	8278	0.88	(0.32)	1939	0.92	(0.27)	10217
Medically supervised birth	0.70	(0.46)	8278	0.51	(0.50)	1939	0.66	(0.47)	10217
Under 1 child mortality	0.04	(0.21)	19148	0.06	(0.24)	7099	0.05	(0.22)	26247
Under 5 child mortality	0.06	(0.23)	19148	0.08	(0.27)	7099	0.06	(0.24)	26247
Subjective wellbeing index	0.31	(6.18)	9967	−1.01	(5.88)	2993	0.00	(6.14)	12960
Self-assessed health (good or very good)	0.84	(0.37)	27939	0.85	(0.36)	9962	0.84	(0.37)	37901
Mental Health	0.87	(0.34)	18194	0.88	(0.32)	5222	0.87	(0.33)	23416
Child's Weight-for-age z-score	−0.87	(1.24)	8595	−1.05	(1.22)	2712	−0.91	(1.24)	11307
Child Underweight	0.17	(0.38)	8595	0.22	(0.41)	2712	0.18	(0.39)	11307
Child's Height-for-age z-score	−1.15	(1.44)	8595	−1.38	(1.49)	2712	−1.21	(1.46)	11307
Child Stunted	0.30	(0.46)	8595	0.39	(0.49)	2712	0.32	(0.47)	11307
Child has a birth certificate	0.55	(0.50)	10238	0.28	(0.45)	2388	0.50	(0.50)	12626
Child is fully vaccinated	0.78	(0.41)	7430	0.71	(0.45)	1913	0.77	(0.42)	9343
Child's cognitive ability (z- score)	0.04	(0.98)	4511	−0.14	(1.05)	1122	0.00	1	5633
Children's education (years)	10.7	(3.58)	8512	7.70	(2.73)	672	10.5	(3.6)	9184
Islam	0.85	(0.35)	11481	0.91	(0.28)	2687	0.86	(0.34)	14168
Protestant	0.08	(0.26)	11481	0.04	(0.20)	2687	0.07	(0.25)	14168
Catholic	0.02	(0.15)	11481	0.01	(0.09)	2687	0.02	(0.14)	14168
Hindu	0.05	(0.21)	11481	0.03	(0.18)	2687	0.05	(0.21)	14168
Other religion	0.00	(0.03)	11481	0.00	(0.03)	2687	0.00	(0.03)	14168
Birth in a hospital	0.27	(0.45)	6946	0.14	(0.35)	1939	0.25	(0.43)	8547
Birth in a clinic or health post	0.45	(0.50)	6946	0.38	(0.49)	1939	0.43	(0.50)	8547
Birth in home or homelike environment	0.28	(0.45)	6946	0.47	(0.50)	1939	0.32	(0.47)	8547
Biological parents married at age 12	0.88	(0.33)	11481	0.84	(0.37)	2687	0.87	(0.34)	14168
Paternal years of education	6.44	(4.20)	11481	4.43	(3.60)	2687	6.06	(4.17)	14168
(b)									
Educational attainment (years)	9.79	(3.97)	11869	6.11	(3.47)	323	9.70	(4.00)	12192
Labor Force Participation	0.95	(0.22)	29003	0.98	(0.14)	1219	0.95	(0.22)	30222
Formal Sector Employment	0.46	(0.50)	28430	0.27	(0.45)	1234	0.45	(0.50)	29664
Log hourly wage	7.76	(2.62)	14602	6.54	(3.36)	412	7.73	(2.65)	15014
Log per capita consumption	15.11	(1.30)	29003	14.54	(1.31)	1219	15.09	(1.30)	30222
First marriage ended in divorce	0.03	(0.16)	11918	0.09	(0.28)	324	0.03	(0.17)	12242
Decision-making index	3.37	(1.15)	20624	3.21	(1.11)	878	3.33	(1.15)	21502
Subjective wellbeing index (standardized)	0.05	(6.06)	9601	−1.43	(5.98)	324	0.00	(6.06)	9925
Self-assessed health (good or very good)	0.88	(0.33)	29003	0.86	(0.35)	1219	0.88	(0.33)	30222
Mental Health	0.88	(0.32)	19089	0.89	(0.31)	645	0.88	(0.32)	19734

Table 10 Effects of Child Marriage on Women's and Men's Health

	(1)	(2)	(3)	(4)
A. Dependent Variable: Women's Self-Assessed Health (Good or very good)				
Child marriage	−0.01* (0.004)	−0.004 (0.004)	−0.002 (0.005)	0.005 (0.02)
Mean dep. var.	0.84	0.84	0.84	0.83
Observations	37,901	37,901	37,901	1612
B. Dependent Variable: Women's Mental Health				
Child marriage	−0.004 (0.01)	−0.01* (0.01)	−0.002 (0.006)	−0.002 (0.03)
Fixed effects	–	Province × Survey Wave	Village × Survey Wave	Sisters
Mean dep. var.	0.87	0.87	0.87	0.82
Observations	23,416	23,416	23,416	1222
C. Dependent Variable: Men's Self-assessed health				
Child marriage	−0.03*** (0.01)	−0.02** (0.01)	−0.02* (0.01)	
Mean dep. var.	0.877	0.877	0.877	
Observations	30,222	30,222	30,222	
D. Dependent Variable: Men's Mental health				
Child marriage	−0.01 (0.01)	−0.02 (0.01)	−0.01 (0.01)	
Mean dep. var.	0.881	0.881	0.881	
Observations	19,734	19,734	19,734	
Fixed effects	–	Province × Survey Wave	Village × Survey Wave	

Standard errors are clustered at the village level in Columns (1)-(3) and at the family level in column (4). ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$. Specifications in Columns (2) to (4) also included controls for Islamic religion, age, paternal education and whether parents were married when respondent was aged 12

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