



Women's Marriage Age Matters for Public Health: A Review of the Broader Health and Social Implications in South Asia

Akanksha A. Marphatia*, Gabriel S. Ambale and Alice M. Reid

Department of Geography, University of Cambridge, Cambridge, United Kingdom

OPEN ACCESS

Edited by:

Joseph B. Stanford,
University of Utah, United States

Reviewed by:

Silvia Carlos,
Universidad de Navarra, Spain
Florence Samkange-Zeeb,
Leibniz Institute for
Prevention Research and
Epidemiology – BIPS, Germany
Margaret Eleanor Greene,
GreeneWorks, United States

*Correspondence:

Akanksha A. Marphatia
aam54@cantab.net

Specialty section:

This article was submitted
to Population, Reproductive
and Sexual Health,
a section of the journal
Frontiers in Public Health

Received: 10 May 2017

Accepted: 19 September 2017

Published: 18 October 2017

Citation:

Marphatia AA, Ambale GS and
Reid AM (2017) Women's Marriage
Age Matters for Public Health:
A Review of the Broader Health and
Social Implications in South Asia.
Front. Public Health 5:269.
doi: 10.3389/fpubh.2017.00269

In many traditional societies, women's age at marriage acts simultaneously as a gateway to new family roles and the likelihood of producing offspring. However, inadequate attention has previously been given to the broader health and social implications of variability in women's marriage age for public health. Biomedical scientists have primarily been concerned with whether the onset of reproduction occurs before the woman is adequately able to nurture her offspring and maintain her own health. Social scientists have argued that early marriage prevents women from attaining their rightful education, accessing employment and training opportunities, developing social relationships with peers, and participating in civic life. The aim of this review article is to provide comprehensive research evidence on why women's marriage age, independent of age at first childbirth, is a crucial issue for public health. It focuses on data from four South Asian countries, Bangladesh, India, Nepal, and Pakistan, in which marriage is near universal and where a large proportion of women still marry below the United Nations prescribed minimum marriage age of 18 years. Using an integrative perspective, we provide a comprehensive synthesis of the physiological, bio-demographic, and socio-environmental drivers of variable marriage age. We describe the adverse health consequences to mothers and to their offspring of an early age at marriage and of childbearing, which include malnutrition and high rates of morbidity and mortality. We also highlight the complex association of marriage age, educational attainment, and low societal status of women, all of which generate major public health impact. Studies consistently find a public health dividend of increased girls' education for maternal and child nutritional status and health outcomes. Paradoxically, recent relative increases in girls' educational attainment across South Asia have had limited success in delaying marriage age. This evidence suggests that in order for public health initiatives to maximize the health of women and their offspring, they must first address the factors that shape the age at which women marry.

Keywords: women, marriage age, public health, demography, education, geography, South Asia

INTRODUCTION

United Nations (UN) Conventions and Resolutions consider "child, early, and forced marriage" as a fundamental violation of human rights (1). Marriage before 18 years is considered to be a harmful practice because it denies girls the right to the highest attainable standard of general, sexual, and reproductive health, and to a life free from violence (1, 2). Under-age marriage also

constrains evolving physical, emotional, and personal maturity required to safely and successfully transition to adulthood (3, 4). It places restrictions on opportunities in life, such as the right to education. Under-age marriage also restricts women's ability to fully participate in family, socio-cultural, and civic activities (3). Collectively, these consequences have major implications for public health.

Several UN agreements define parameters relating to marriage and reproduction, including establishing a minimum allowable marriage age. Women have equal rights to men to "freely chose a spouse and to enter into marriage only with their free and full consent" (1). Women also have the right to good reproductive and sexual health. This includes a satisfying and safe consensual sexual experience, the capability to reproduce, and the freedom to decide if, and when, to bear a child. Access to timely and adequate health care for women and their children is also essential (5). Since marriage entails adult responsibilities and also understanding of its consequences, setting a minimum age is a legal guarantee that adult responsibilities are not assigned to children prematurely (6). The age at which legal majority or adulthood is reached is thus important for establishing a minimum age of marriage: Human Rights Conventions set both at 18 years (3, 7).

By ratifying these international agreements, governments are expected to legislate a minimum age at marriage for both sexes, ideally at 18 years. Globally, however, it ranges from 10 to 20 years, meaning legal protection is often not offered to children when the majority status of "adulthood" is reached *via* marriage before 18 years (6). In absolute terms, only 11 countries have established a minimum legal marriage age at 18 years without any dispensation; 73 have an ascribed minimum age but allow

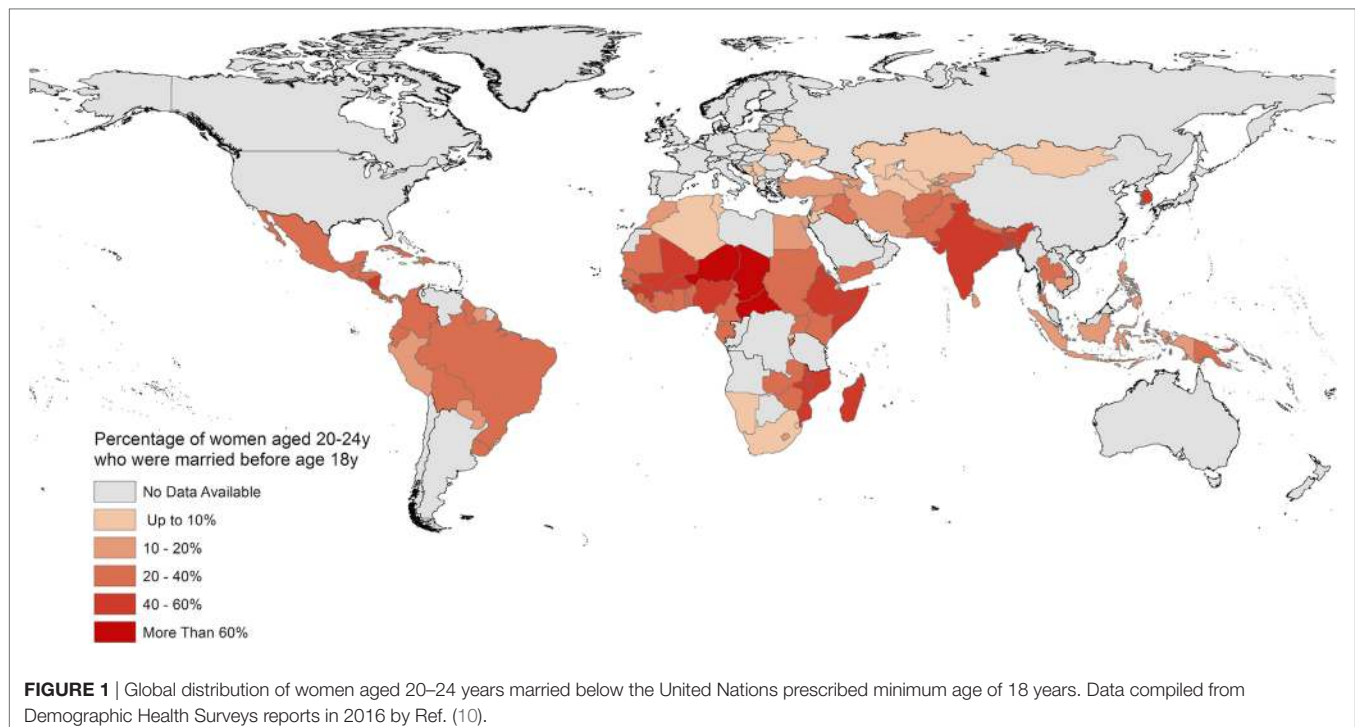
exceptions below 18 years, usually for girls; and 102 have unclear information or no established minimum marriage age (6).

Scale and Geographic Distribution of Women's Under-Age Marriage

In many low- and middle-income countries, a greater proportion of females than males marry "under-age," or below the UN legal threshold of 18 years. In 2011, an estimated 720 million women aged 18 years or older were married under-age compared with 156 million boys (8). The reasons for which the two sexes marry under-age most likely differ and merit appropriate consideration. However, in this review of public health implications, we focus on why girls marry under-age.

Between 2000 and 2011, one in three women aged 20–24 years in the global south (excluding China) were estimated to have married before they reached the age of 18 years (9). In 2010, this was equivalent to nearly 67 million women, with approximately one in nine or 12% marrying as children, before the age of 15 years (9). At the current rate, 39,000 girls are projected to marry under-age each day, amounting to over 14.2 million girls each year over the next decade (9).

Figure 1 illustrates the global geographical distribution of women aged 20–24 years married "under-age." The data used to produce this map was compiled by the United Nations Children's Fund in May 2016 from national Demographic Health Surveys (DHS), Multiple-Indicator Cluster Surveys, and other nationally representative surveys conducted between 2008 and 2014 (10). The region with the highest national prevalences comprises central Africa, however, in absolute terms nearly half of all under-age marriages worldwide occur in South Asia.



Weak political recognition of “under-age” marriage and its corresponding high prevalence for girls is a crucial issue for public health. While its importance is recognized across different academic fields, they approach the issue from contrasting perspectives. For example, social scientific research identifies how early marriage is associated with adverse human capital outcomes such as limited opportunities for personal and educational development. Yet the failure of education, the key intervention used to delay girls’ marriage age, is stark. Although 60% of girls in South Asia now attend secondary school, over half still marry before 18 years (11).

In contrast, demographic and public health research focus on *early age at childbirth* as the key event in women’s lives leading to multiple adverse maternal and child health outcomes. However, in traditional societies childbirth usually *follows soon* after marriage (12, 13). **Figures 2A–D** are adapted and redrawn from DHS data produced by MacQuarrie on women aged 25–49¹ years. In the four South Asian countries with the highest prevalence of under-age marriage, first childbirth occurred on average 2.5 years after marriage (16). Marriage age remains the most consistent influence on the first birth interval, even after controlling for birth cohort, gendered context², spousal educational attainment,

and socio-economic characteristics (16). This evidence suggests that the key decision which needs to be delayed in this population is marriage age, which will invariably lead to an older age at childbirth.

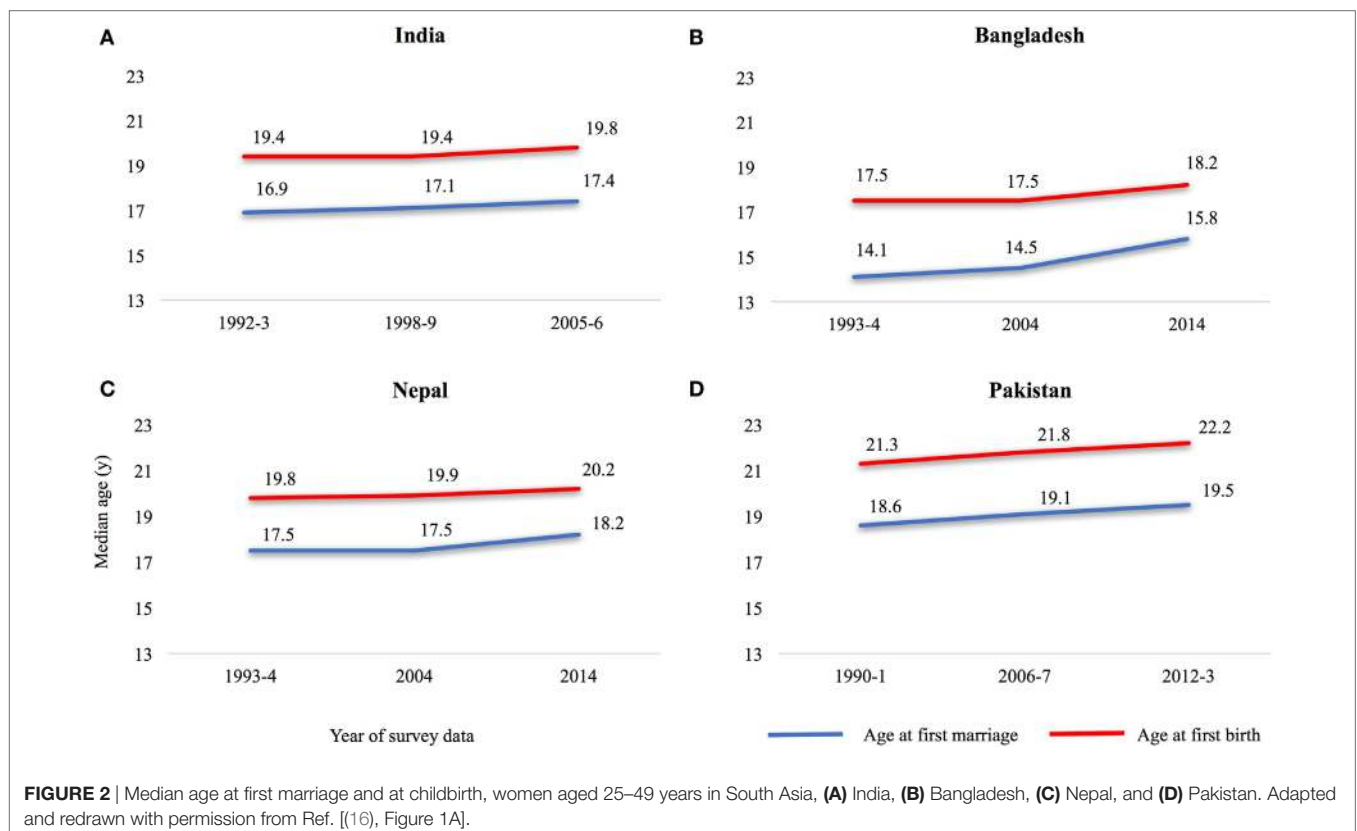
Aims and Methodology

The aim of this review is to provide comprehensive research evidence on why women’s marriage age, independent of age at first childbirth, is a crucial issue for public health. We go beyond what has previously been done by synthesizing key insights and inter-linkages from the demographic, health, and human capital literatures. Our novel contribution is to demonstrate that women’s under-age marriage is the “gateway” to the detrimental trans-generational consequences of early childbearing. Marriage age is also a marker of women’s human capital and overall status in society. We seek to share new knowledge on why four South Asian countries, Bangladesh, India, Nepal, and Pakistan, have the highest global prevalence of girls’ under-age marriage.

We searched relevant databases (e.g., PubMed and Eric) for empirical research and review articles in international peer-reviewed journals. We also conducted a broader search (using Google scholar and Google) for gray policy literature published by international development organizations, the UN and national governments on research, legislation, and secular trend data on women’s marriage age. Given the cross-disciplinary approach of our review, we focused on papers that were relevant to public health, demography, and also the social predictors and

¹Data were not available for all countries and all time-points for the recent cohort of women aged 20–24 because less than 50% of women began living with their spouse for the first time before reaching the beginning of the age-group (14,15).

²The gendered context was measured by the extent to which women participated in household decision-making, accepted/experienced violence, and their spousal age gap (16).



consequences of women's marriage age. We searched for papers using the following key terms relating to girls/women: "child marriage," "early marriage," "adolescent marriage," "under-age marriage," and their inter-linkage with "adolescent pregnancy and health," "women's reproductive/sexual, mental health," "violence against women," "fertility," "maternal and child nutritional status/mortality," "education," "socio-cultural norms," "poverty/dowry/economic status," "women's social status," "autonomy," and "empowerment." Given the breadth of literature available, our review does at times draw on studies beyond South Asia. Some of our findings are likely to apply more widely. Others might relate to the socio-cultural context of marriage.

A complexity in understanding these inter-linkages is the inconsistent disaggregation of age-categorizations across studies. We address this by adopting a dual spatio-temporal approach. Data on the previous generation of women aged 25–49 years enables us to illustrate secular changes in marriage age and childbearing, and also to emphasize the consequences and benefits conferred to variable marriage age. Data on the most recent cohort of women aged 20–24 years who married below 18 years provides critical insights on the penalties of marrying young in contemporary societies.

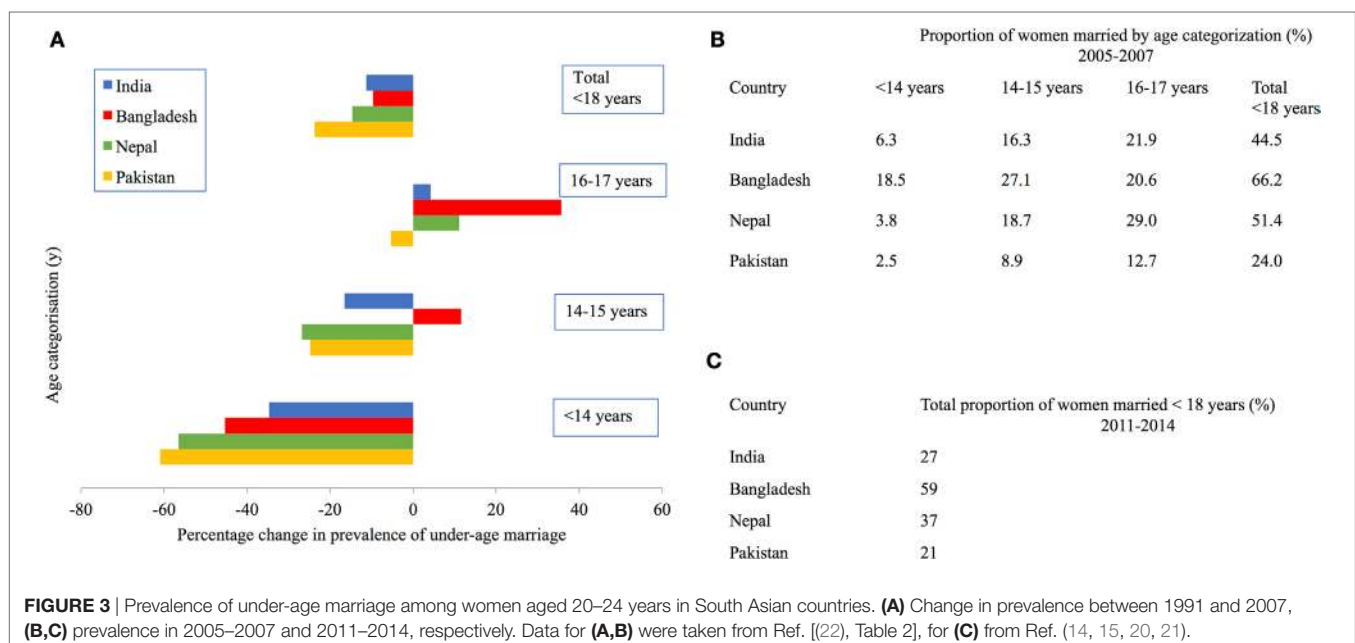
There are four sections to this review. Section "Marriage in South Asia" sets out the social context of marriage. It also describes changes in the prevalence of under-age marriage in the four South Asian countries of our review. Section "Consequences of Women's Under-Age Marriage" provides an integrated perspective on the broad demographic, health, and human capital consequences of early marriage. Section "Predictors of Under-Age Marriage" provides new insights from this diverse literature on the drivers of variability in marriage age. We recognize that separating the consequences from the predictors is in part artificial because of the potential two-way direction of association. However, this approach enables us to critically assess why the high prevalence

of under-age marriage persists despite increasing knowledge of its consequences. In Section "Discussion," we discuss the opportunities and challenges flowing from these mutual fields of interest for research and practice.

MARRIAGE IN SOUTH ASIA

In the geographical region of South Asia, complex cultural and religious dynamics set parameters around marriage. Generally, for both sexes, marriage is perceived as an essential stage in the life-course and there are strong social sanctions for childbearing outside of marriage (17). As a social institution, marriage is identified by some studies as near universal (18). Generally, any variation relates to the age at which marriage takes place, rather than whether it happens at all. Women also tend to marry younger than men. For example, about 90% of women aged 15–49 years were married by ages 25–29 years in Bangladesh, India, and Nepal compared with 80% of men; marriage is nearly universal among women aged 30 and above and men aged 45 and above (14, 15, 19, 20).

Recent DHS data from 2011 to 2014 show that Bangladesh, India, Nepal, and Pakistan have the highest prevalence of women aged 20–24 years marrying under-age (59, 27, 37, and 21, respectively) (14, 15, 20, 21). This translates into tens of millions of girls in each of these countries. Further distinctions in the age at marriage are important to recognize because changes in the prevalence of "child" (<14 years of age) marriages and those taking place during "early-adolescence" (14–15 years) and "late-adolescence" (16–17 years) have differed over the past two decades in these countries. **Figure 3A** uses DHS data produced by Raj et al. to show that between 1991 and 2007, the overall prevalence of marriage below 18 years in women aged 20–24 years decreased. This was largely attributed to fewer marriages below 15 years. The change in the prevalence of marriages at 16–17 years



varied across the four countries. There was a marginal decrease in Pakistan and a slight increase in India. However, the proportion of girls marrying in late-adolescence increased substantially in Nepal and Bangladesh (22). **Figure 3B** also uses Raj's et al.'s data from 2005 to 2007 to show that the net effect is that under-age marriage is concentrating in a slightly older age range, but still below 18 years. These patterns are important to recognize because the predictors and consequences of marriage in these different age groups are likely to be different. **Figure 3C** uses the most recent DHS data from 2011 to 2014 to show the total prevalence of girls marrying <18 years is reported to have decreased further in these countries (14, 15, 20, 21). Disaggregated data by age groups were not yet available. While this trend is promising, a large proportion of women still marry soon *after* 18 years. These women may experience some of the consequences of those who married under-age, in late-adolescence.

Despite having ratified international conventions protecting the rights of children and women generally, many South Asian

countries have not ratified agreements directly addressing under-age marriage and the universally ascribed minimum age of 18 years. **Table 1** uses data produced by the UN Office for the High Commissioner and the international advocacy group, *Girls Not Brides*, on the ratification status of these international agreements (23–25). Differences between international and national laws suggest that women's marriage age is, above all, culturally defined.

Table 1 shows that national secular legislation allows marriage at 16 years in Pakistan, 18 years in India, and 20 years in Nepal (26). However, Sharia and Mohammedan law permit marriage for girls at 14–15 years in Bangladesh, India, and Pakistan (26). In Bangladesh, an international debate ensues over a new Act approved by Parliament in 2017 to allow marriage below 18 years in "special cases," ostensibly omitting obligation to a minimum allowable marriage age for girls (29). Weak national marriage and birth registration systems mean that even the current high prevalence of under-age marriage and rates of adolescent fertility are likely to be under-estimated (14, 15, 20, 21, 26).

TABLE 1 | International agreements and national law on minimum marriage age and marriage and birth registration in South Asia.

	Bangladesh	India	Nepal	Pakistan
Key international Conventions and Resolutions relating to marriage or child protection and ratification date^{a,b}				
Convention on the Consent to Marriage, Minimum Age for Marriage and Registration of Marriages (1962) ^c	1998	Not ratified	Not ratified	Not ratified
International Covenant on Economic, Social, and Cultural Rights (1966) ^d	1998	1979	1991	2008
Convention on the Elimination of All Forms of Discrimination Against Women (1979) ^d	1984	1993	1991	1996
Convention on the Rights of the Child (1989) ^d	1990	1992	1990	1990
Resolution on Child, Early, and Forced Marriage (2014) ^e	Not adopted	Not adopted	Not adopted	Not adopted
National legislation on minimum marriageable age				
National legislation ^f	Child Marriage Restraint Act (1929); Child Marriage Prevention Act (2014)	Prohibition of Child Marriage Act (2006)	Marriage Registration Act 2028 (1971)	Child Marriage Restraint Act (1929); Muslim Family Law Ordinance (1961)
Statutory law on marriage and majority age ^f	In 2017, "special circumstances" for girls marrying at any age, previously 18 years girls 21 years boys. Majority age both sexes 18 years	Marriage age 18 years girls 21 years boys. Majority age both sexes 18 years	Marriage age 20 years both sexes. Majority age both sexes 18 years	Marriage age 16 years girls 18 years boys. Majority age both sexes 18 years
Customary/religious law on marriage age ^f	Special Marriage Act (1872) non-religious marriage, parental consent; Muslim Personal Law 14 years girls	Sharia and Mohammedan Law with parental consent 15 years girls	National Code with parental consent both sexes 18 years	Child Marriage Act (1872) non-religious union parental consent 14 years girls
Registration of marriage and births of children under 5 years of age (years)				
Requirements for registering marriage ^f	Optional, Hindu Marriage Act; Required, Christian, Muslim laws	Mandatory	Mandatory	Mandatory
Percentage of births registered	19% rural, 23% urban (2014) ^g	76% rural, 89% urban (2015–2016) ^h	42% rural, 44% urban (2011) ⁱ	23% rural, 59% urban (2012–2013) ^j

^aA convention is a treaty or formal agreement between States, which, if ratified, is legally binding; States must adhere to creating legal rights and duties according to this instrument (167). ^bA resolution is a formal expression of views of Member States which is not legally binding; the implementation of policy recommendations is the responsibility of each Member (28). Data from Ref. ^c(25), ^d(23), ^e(24), ^f(26), ^g(20), ^h(21), ⁱ(15), and ^j(14).

CONSEQUENCES OF WOMEN'S UNDER-AGE MARRIAGE

Demographic Consequences

This section focuses on the association between under-age marriage and demographic outcomes of fertility and population growth and its related implications for sex-selective abortion and contraception. Implications for maternal and child mortality are addressed in the following section on health consequences. The mechanisms through which these effects operate relate partly to exposure and opportunities for getting pregnant, partly through generation length, and partly through biological, behavioral, and socio-economic factors. Simulations from ecological analyses of 97 countries suggest that a 10% increase in girl child marriage would be associated with a 3% increase in the infant mortality rate, a 0.3% increase in the total fertility rate, a 70% increase in the maternal mortality ratio, and a 10% decrease in skilled birth attendance (30). The magnitude of this problem is large in the South Asia region, as demonstrated below.

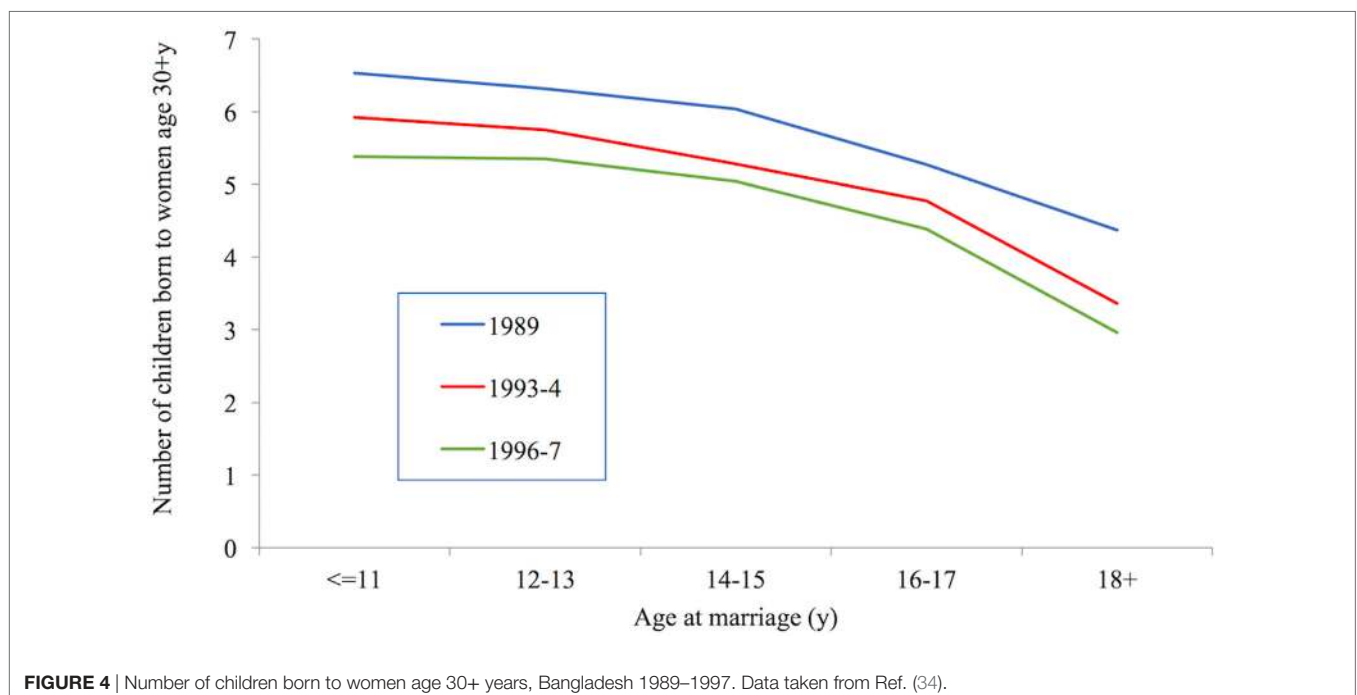
In South Asia, unlike many other parts of the world, marriage is still the main context for sexual intercourse. Getting married therefore signals the start of exposure to the chance of becoming pregnant and the earlier a woman gets married, the longer she will spend exposed during her fertile years. Studies find that in the absence of modern contraception, the age at which women marry is the main determinant of the number of children each woman will have (31). Marriage age also plays a very important role in lowering fertility levels from the biological maximum. The availability of reliable contraception offers the chance to thwart this relationship by stopping at a particular desired number of children or by increasing the spacing between births. However, simulations have shown that women who marry young still have

more children at the end of their reproductive careers because there is more time for them to increase their desired numbers of births and more opportunity for contraceptive failure to increase fertility (32).

Fertility

Empirical studies find that despite some teenage sub-fecundity, early marriage is associated with higher completed fertility at the end of the childbearing years.³ **Figure 4** shows Bangladesh Fertility Survey and DHS data produced by Kabir et al. which demonstrate that in each of three successive surveys in late 20th century Bangladesh, the younger a woman had married the more children she had produced by the age of 30 years (34). The reference value in the figure is women aged 20–34 years. Nahar et al.'s study confirms the persistence of this trend: among women aged 50 years in the 2007 DHS survey of Bangladesh, those who had married at 19 years or over had on average 2.62 children compared with 3.55 among those who had married between 17 and 18 years, and 4.59, 5.53, and 6.36 among those who had married at 15–16, 13–14, and 12 years and under, respectively (35). Similarly, Adhikari demonstrated that among women aged 40–49 years in the 2006 Nepal DHS, those who had married at 16 years or older had on average 4.7 children compared with 5.3 among those who married before 16 years (27).

³Teenage pregnancies in places where pre-marital intercourse is common are likely to result in higher completed fertility due to a link between fecundity and the likelihood of getting pregnant in the first place, and due to the negative effect of a teenage pregnancy on education and career progression (33). This is not considered to be a major factor in South Asia where pre-marital intercourse remains rare, and it can complicate comparisons of marriage age and fertility between different parts of the world.



So far, we have discussed the association of age at marriage on the number of children born to each woman. However, age at marriage can have a strong effect on a country's fertility rate even if there are no differences in completed fertility by age at marriage. This is because younger marriage means younger childbearing, and younger childbearing means reduced generation length and more women able to have children at any one time. This increases the crude birth rate which has a positive impact on population growth. Coale and Tye calculated the impact of shifting the age patterns of childbearing from those existing in India in 1956, where fertility was highest in the 20–24 year old age group, to those experienced by the Singapore Chinese population, where fertility was highest in the 25–29 year old age group. Over the course of 10 years this would lower the crude birth rate by 8% without any change in the mean number of children born per woman, simply by increasing the mean generation length by 2.7 years (36).

Childbearing and Access to Contraception

Comparisons of completed fertility are informative, but because they relate to women who married several decades ago, they may already represent a picture that is out of date. Other studies therefore compare the speed of childbearing among younger women. Raj et al.'s study of 20–24 year old women in India (37) and Nasrullah et al.'s of 20–24 year old women in Pakistan (38) demonstrated shorter birth intervals (i.e., more rapid childbearing) among women who had married before age 18 years than among later marriers, although this is not universally found. Godha et al.'s comparative study of the four South Asian countries considered here did not support a higher pace of childbearing among early marriers (39). A faster pace of childbearing could be the consequence of higher desired fertility among women who marry young, or among their husbands. Additional plausible explanations for faster childbearing include poorer contraceptive

knowledge, access to other birth control methods and less control over family planning decisions. These explanations are supported by **Figure 5** which uses DHS data produced by Godha et al. to show that women who married early had more unplanned pregnancies and more terminations of pregnancy, which are firmer indicators of poor contraceptive knowledge, access, and control (39). The survey data come from the following countries and years: India (2005–2006), Bangladesh (2007), Nepal (2006), and Pakistan (2006–2007). Nasrullah et al.'s study revealed that these differences remained even after controlling for husbands' fertility desires and son preference (38). Similar results were obtained in a further study of Bangladesh, although this study is not strictly comparable as it used a wider age range of women (40).

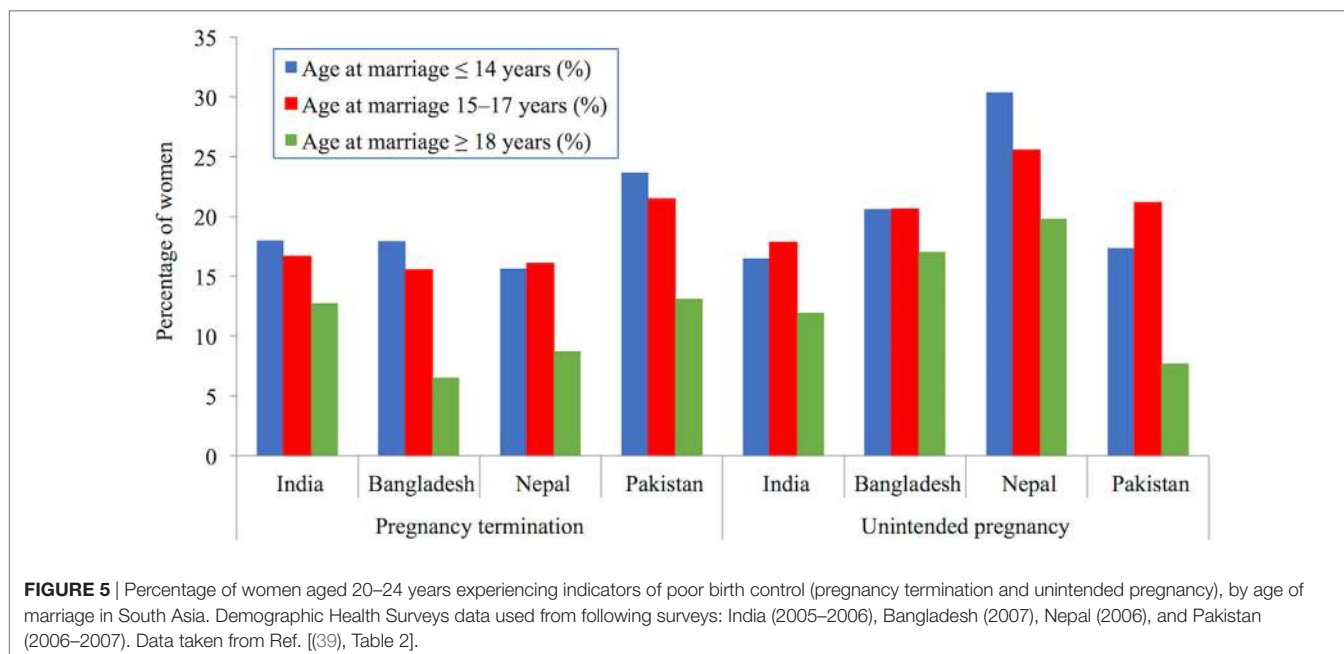
Women in India and Pakistan who marry early are therefore likely to have poorer access to and control over contraception, to have children quicker, and to have more unplanned (or unwanted) children. Child brides from India are also four times more likely than later marriers to have been sterilized by the age of 20–24 years (37). The higher likelihood of termination among early marriers may also be linked to strong son preference and sex selection (37, 38, 40, 41). While these are effective ways of preventing further unplanned pregnancies, they have also been linked to lower female autonomy. Reduced condom use also puts women's sexual health at risk by increasing the chance of contracting sexually transmitted infections (42).

The following section relates to the health implications of some of these demographic outcomes for maternal and child health, nutritional status, and survival.

Maternal Outcomes

Access to Healthcare and Pregnancy- and Childbirth-Related Morbidity

Much of the public health research focuses on an early age at childbearing, the adverse health outcomes from which are



partly attributed to young married women having lower access to contraception, ante-natal care, and delivery by skilled health care workers or in health care facilities (39). In the South Asian context, early childbearing is strongly linked to early marriage. Using DHS data produced by Godha et al., **Figure 6** shows that early marriage is strongly associated with a lower likelihood of accessing adequate ante-natal and delivery care (39, 43). The survey data come from the following countries and years: India (2005–2006), Bangladesh (2007), Nepal (2006), and Pakistan (2006–2007).

Early childbearing is associated with high maternal morbidity during pregnancy and labor. An analysis of 312,297 deliveries across 29 countries (including India and Nepal) participating in the WHO Multi-country Survey on Maternal and Newborn Health found that compared with mothers aged 20–24 years, adolescent mothers under 16 years of age had higher risks of cesarean section delivery, eclampsia (seizures which can lead to coma, cerebral hemorrhage, and cardiac arrest), puerperal endometritis (uterine infection), and systemic infections (44). The magnitude of the risk was generally higher for the youngest mothers, aged 15 years or less. Early sexual initiation and childbirth are also associated with a higher risk of developing fistula (involuntary urinary incontinence and/or leakage of feces), a debilitating condition which often leads to social exclusion (45, 46). Comprehensive data on the magnitude of this problem are lacking in South Asia, although one study of >5,000 women in Pakistan estimates vesico-vaginal fistula affects 3.9 per 1,000 women and 4.5 per 1,000 parous women (47).

Nutritional Status

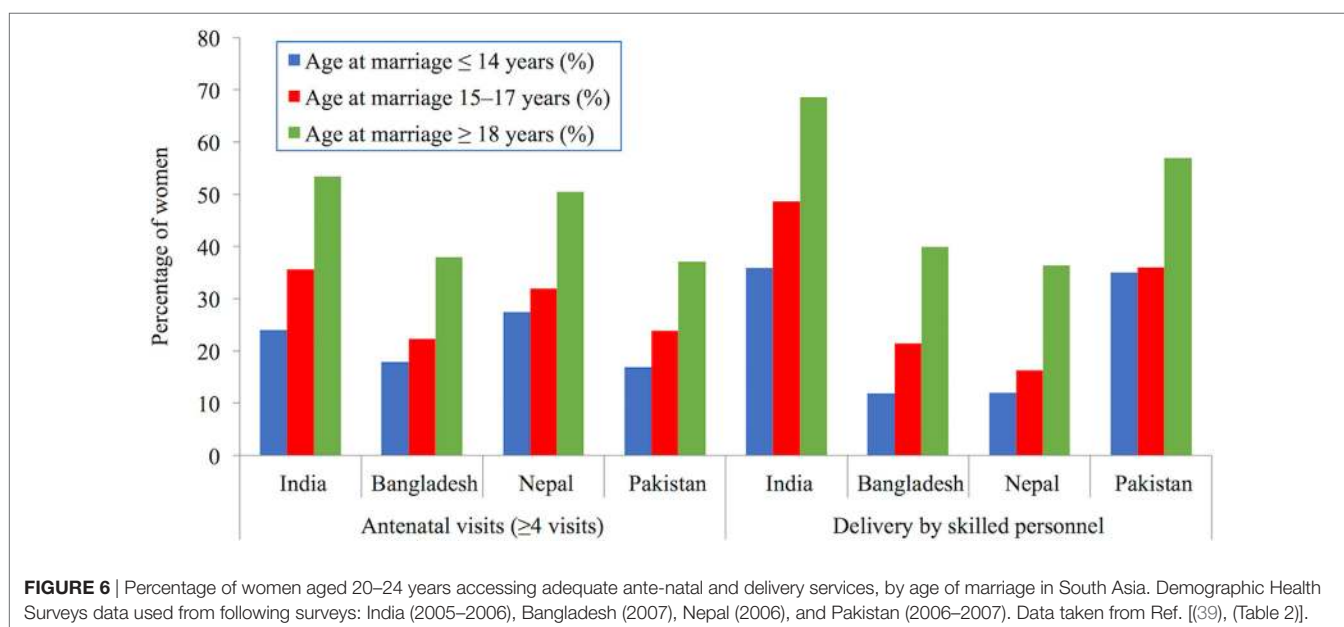
Younger mothers are also more likely to be undernourished. In India, a third of adolescent girls marrying and giving birth <18 years were categorized as “thin” [body mass index (BMI) of <18.5] and 58% had severe to mild anemia. Overall, girls married under-age were twice as likely to be undernourished as those

married at age 25 years or above (48). This high rate of malnutrition among young mothers is a critical public health concern because adolescence is a period of nutritional vulnerability due to rapid growth and development. In healthy individuals, an estimated 50% of adult weight and more than 15% of adult height is gained between the years of 10–19 years (49). By beginning their reproductive careers during this critical period of physical growth, before biological maturity, undernourished adolescents are likely to attain a shorter adult stature than expected, and hence an increased risk of health complications (50, 51). In Bangladesh, a study comparing 700 pregnant and non-pregnant adolescents found that pregnancy and lactation curtailed linear growth and resulted in weight loss and depletion of fat and lean body mass of young girls (52). Pregnancy and lactation are also likely to increase the nutritional vulnerability of adolescent girls by depleting fat stores and micronutrients (52).

Mortality

Many of these pregnancy- and childbirth-related morbidities carry a risk of death. Many older studies have found a higher maternal mortality ratio (defined as deaths to mothers during pregnancy, childbirth or in the 42 days following delivery from pregnancy or childbirth-related causes, per 1,000 births) in mothers under the age of 20 years (53). However, recent studies show that this is not as high as previously thought. There is a relatively small excess adolescent risk, with the lowest risk among 20–24 year old mothers, and then sharply increased risks corresponding to greater maternal age (54, 55). Among adolescents, the risks are higher for younger women, particularly those under age 16 years (44, 56). Young mothers are particularly vulnerable to pregnancy-related morbidity such as death from eclampsia (57).

There are a number of reasons why young wives and mothers might be at higher risk of maternal morbidity and mortality: physiological factors, bio-demographic factors, and socio-environmental factors. Physiological factors include



biological immaturity in women which could account for conditions such as cephalo-pelvic disproportion. Bio-demographic factors include parity (how many pregnancies the mother has previously had) which is important because young mothers are more likely to be nulliparous (having their first baby). First pregnancies are also at higher risk than second and third, particularly from eclampsia. Socio-environmental or behavioral factors include wealth, education, access to ante-natal care, contraception, health facilities, and so on.

It is difficult to disentangle these influences, but the fact that in some (but not all) analyses the excess mortality for adolescent wives and mothers disappears when bio-demographic and socio-environmental factors are controlled suggests that the main drivers of excess mortality among young mothers may fall into these categories (44, 56, 58). The fact that adolescent mothers are less likely to be educated, wealthy, urban dwellers means that they are less likely to access the ante-natal care which can help them negotiate a safe path through pregnancy and childbirth.

Child Outcomes

Health Outcomes

The health consequences of maternal under-age marriage also extend to their children. Poor maternal nutritional status is in turn associated with a poor start in life for children who are more likely to experience other social and health penalties (59, 60). An analysis of over 19,000 mother-child dyads from the Consortium for Health Orientated Research in Transitioning Societies study in Brazil, Guatemala, India, the Philippines, and South Africa found that in comparison with mothers aged 20–24 years, younger maternal age at first birth (≤ 19 years) had a 20–30% increased risk of low-birth-weight (LBW) and pre-term birth, a 30–40% increased risk of stunting (low height-for-age) of children at 2 years, and failure of children to complete secondary

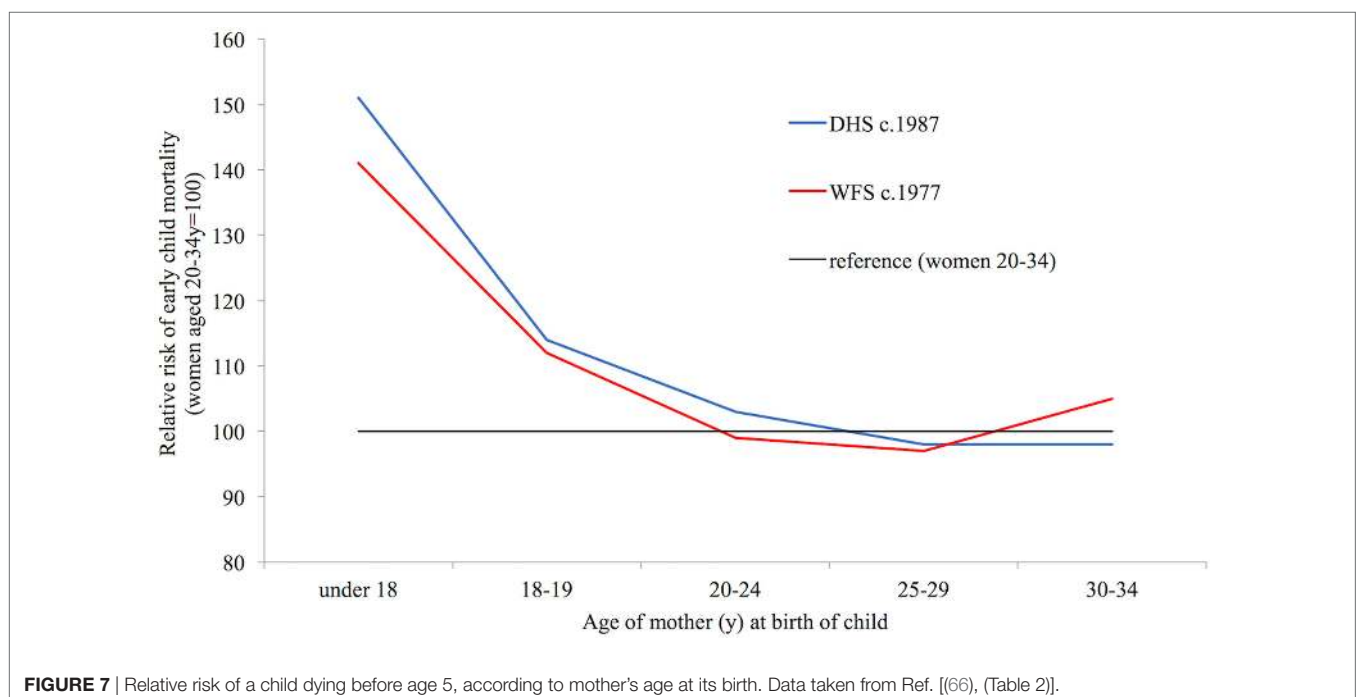
schooling (61). The risk of offspring morbidity also increases since younger mothers produce lower volumes of breast-milk and colostrum, which contains antibodies critical for building infant immunity (62, 63).

Nutritional Status

In India, at first glance, studies find an inconsistent association of maternal marriage age with childhood stunting and underweight. One study found children born to women who married under-age were 20% more likely to be stunted and underweight than those born to older mothers, even after controlling for demographic characteristics and maternal nutritional status (61). In contrast, another study showed maternal marriage age was only weakly associated with children's stunting and underweight (low weight-for-age) (64). However, this study also identified five strong predictors of childhood under-nutrition, which are in themselves associated with maternal under-age marriage. These include short maternal stature, lack of maternal education, low household wealth, poor dietary diversity, and maternal underweight. Hence, children of mothers who experience early childbirth are likely to be at a higher risk of under-nutrition in early life, which is also associated with poorer brain, cognitive and emotional development, and capabilities (65). These factors have enduring physical and mental health and human capital consequences in adulthood.

Mortality

These vulnerabilities also result in higher risks of mortality among the children of younger mothers. According to WFS and DHS data for 18 countries from 1997 to 1987 produced by Hobcraft, compared with the children of mothers aged 20–34 years, children who were born when their mothers were under 18 years of age were 50% more likely to have died before the age of 5 years (Figure 7) (66). Although these are not recent data, the fact that



the child mortality rate among women aged 20–34 years declined from 127 to 89 between the two survey years with no reduction in the age pattern suggests that the pattern is unlikely to have changed much despite further declines in child mortality (66).

As with maternal outcomes, higher risks among the children of younger women can depend on bio-demographic, socio-environmental, and physiological factors. As well as being more risky for the mother, first births are also more dangerous for the child. Some analyses have attributed most of the association between young maternal age and infant mortality to the high proportion of first births and shorter birth intervals which often accompany young motherhood (67). The social disadvantage of young mothers may also contribute to higher risks of death among their children (67). Higher infant mortality among young mothers may be also mediated by physiological factors such as fetomaternal competition for nutrients which can lead to pre-term and LBW infants, who have an elevated risk of infant death (44, 58). Studies which look separately at first births demonstrate a clear mortality penalty for young mothers, showing that the disadvantage cannot be completely attributed to first births and short birth intervals. For example, Hobcraft showed that the risk of death before the age of 5 years for children born to women under the age of 20 years in 18 low- and middle-income countries was around 50% higher than to those born to older women among first births, and also among both well-spaced births and poorly spaced births (66). Finlay et al. find that a mortality penalty remains for the first born children of mothers under 18 years of age in comparison with the first born children of older mothers in 55 low and middle-income countries even when controlling for socio-economic status (68).

Similarly, Raj et al. observe a continued infant penalty for motherhood before 18 years in India, Pakistan, and Nepal even when parity, birth intervals, and socio-economic status were controlled (69). This study estimated that motherhood before age 18 years contributed to 11, 12, and 16% of infant mortality in these countries, respectively. Several studies find that the higher risk of dying around birth or in the month after birth, for the children of young mothers compared with those of older mothers, is almost entirely accounted for by the biological mediators of LBW and pre-term birth, but that the continued higher risks of dying later remain even when available biological, demographic, and socio-economic factors are controlled (70, 71). This suggests that the child-care practices of young mothers might be affected through routes difficult to capture in the sort of surveys frequently used; routes which might include female autonomy and decision-making.

The findings reported here have related to the age of the mother at the time of the child's birth. Although related to age at marriage, it is not always the same thing as women who married young will also have had children at older ages. Few studies examine the effect of early marriage on infant and child mortality while also controlling for age at birth. One study which did control for these factors finds that age at birth and other socio-economic factors partly explain the effect of early marriage on mortality before the age of 5 years and on LBW (72). Therefore, effects of age at marriage on infant mortality could operate partly through age at birth (*via* physiological effects on LBW and prematurity) and partly through socio-economic and female empowerment routes.

Below, we discuss these social factors in detail and how they shape different pathways to women's marriage age. Both are crucial for public health.

Social Consequences

In contrast to the emphasis of public health and demographic research on age at childbearing, social scientific research focuses principally on the social significance of women's age at marriage. The following section reviews key themes arising from this literature. Generally, studies find that women who marry earlier are less likely to have opportunities to develop a general sense of overall well-being. This is in part related to lower participation in education, fewer opportunities for employment and training, development of social networks, and broader civic engagement. Together, these outcomes contribute to women's low status in households and broader society. The key implication for public health is that these outcomes are likely to be associated with poor knowledge of the factors increasing maternal and child poor health, under-nutrition, and mortality. Women who marry at an earlier age are also more likely to have less knowledge about and lower access to contraception, and hence weak control over their fertility and less health care from a trained provider.

Well-being

According to UN statements, under-age marriage constrains overall well-being by denying girls their childhood (1, 3). However, marriage not only accelerates the transition to "womanhood," it also reduces opportunities for personal, emotional, and psychosocial development during the critical middle phase of adolescence (73). During adolescence one's identity, selfhood, and sense of place in society are developed, often in relation to the broader culture and customs (74). Critical knowledge about reproductive and sexual health is also gained during these years, either through school or peer groups (75). Lack of this knowledge, and the implications this psychosocial development has for autonomy, empowerment, and agency, is likely to be associated with adverse health outcomes, for both young mothers and their children.

In patriarchal societies, such as in South Asia, these transitions are not strictly defined by age. They reflect the social roles expected of girls, and also the timing of sexual and physiological development. These factors may also function as a "social signal" for the readiness for marriage (76). For girls, social roles are likely to be restricted to the domestic sphere, to being a daughter, wife, home-maker, and mother (42). For young mothers, the fulfillment of these diverse domestic roles often implies physical and social isolation from the maternal household, peers, and wider society, which may have knock-on effects on their mental health (e.g., susceptibility to depression), nutritional status, and their own and their children's health outcomes (42).

Education

Education plays a crucial role in women's lifecycle by shaping the timing of key events. In South Asian societies where there is usually a "choice" between education and other life opportunities, getting married generally means leaving school (1). Estimates using the Matlab Health and Socio-economic Survey of >2,000 women

aged 25–44 years in Bangladesh confirm this, showing that each additional year of delay in the age of marriage would increase schooling by 0.22 year (77). **Figure 8** uses DHS data produced by MacQuarrie from the most recent surveys: India (2005–2006), Bangladesh (2014), Nepal (2011), and Pakistan (2012–2013). It shows that for women aged 25–49 years, the median age at marriage increases with the level of education completed across South Asia (16). Since childbearing usually follows marriage in these societies, it too is inversely related to education level (16).

Studies consistently find that women with lower levels of education are also more likely to experience multiple vulnerabilities. **Figure 9** uses data on women aged 15–49 years from the recent 2011 DHS report from Nepal (15). It shows that in comparison with women with greater levels of education, women with lower educational attainment are more likely to have poor nutritional status (BMI < 18 kg/m²) and lower access to ante-natal services. These less educated women are also less likely to participate in household decision-making (regarding own health care, purchases, and visiting relatives) and to have experienced violence. There are similar implications of lower maternal education for children's malnutrition and survival. For example, in Nepal the mortality rate for children under 5 years of age born to women

with no education was more than double that of children born to mothers with secondary or higher education: 73 deaths per 1,000 live births compared with 32 deaths per 1,000 live births (15). Similar associations are apparent in Bangladesh, India, and Pakistan (14, 20, 78).

There are also trans-generational penalties of less education. In the context of public health, education is best understood as a key component of maternal phenotype or “capital,” the physiological niche to which each child is exposed to during the start of life (79, 80). Hence, if less education is a “consequence” of maternal under-age marriage, then this cycle of disadvantage may be perpetuated through lower schooling and under-age marriage of daughters, who are likely to experience similar health consequences as their mothers, and pass them onto the next generation (81). Studies suggest there may be a “threshold” effect of education, although the minimum level of schooling required to achieve improved trans-generational outcomes differs across countries (69, 82). For example, Bates et al. find that in Bangladesh, 5 or more years of maternal education was associated with substantial delays in daughters' age at marriage (81). Studies have found similar associations between maternal education and daughter's marriage age in Nepal and Pakistan (83, 84).

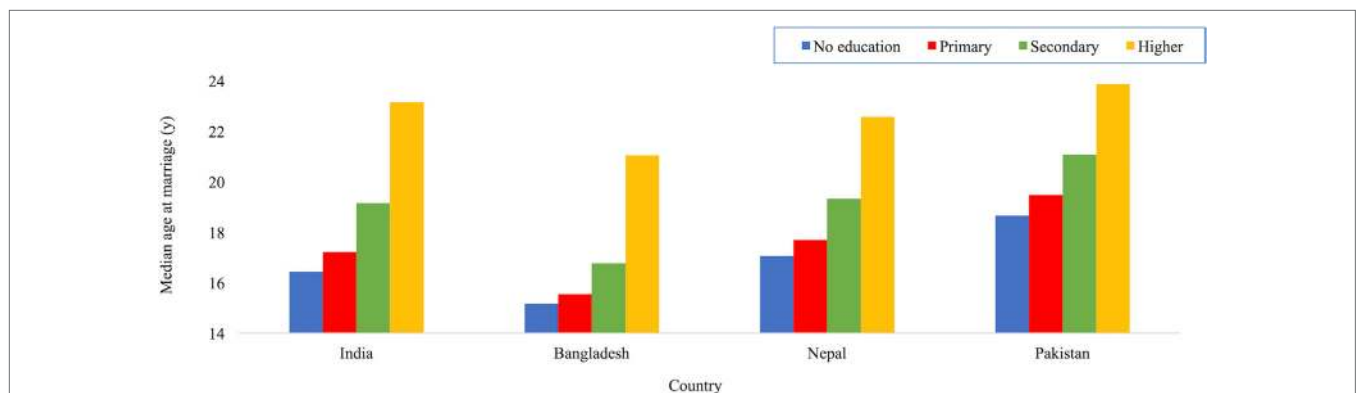


FIGURE 8 | Median age at first marriage by level of education of women aged 25–49 years in South Asia. Drawn with permission using data from Ref. [(16), (Table 7)].

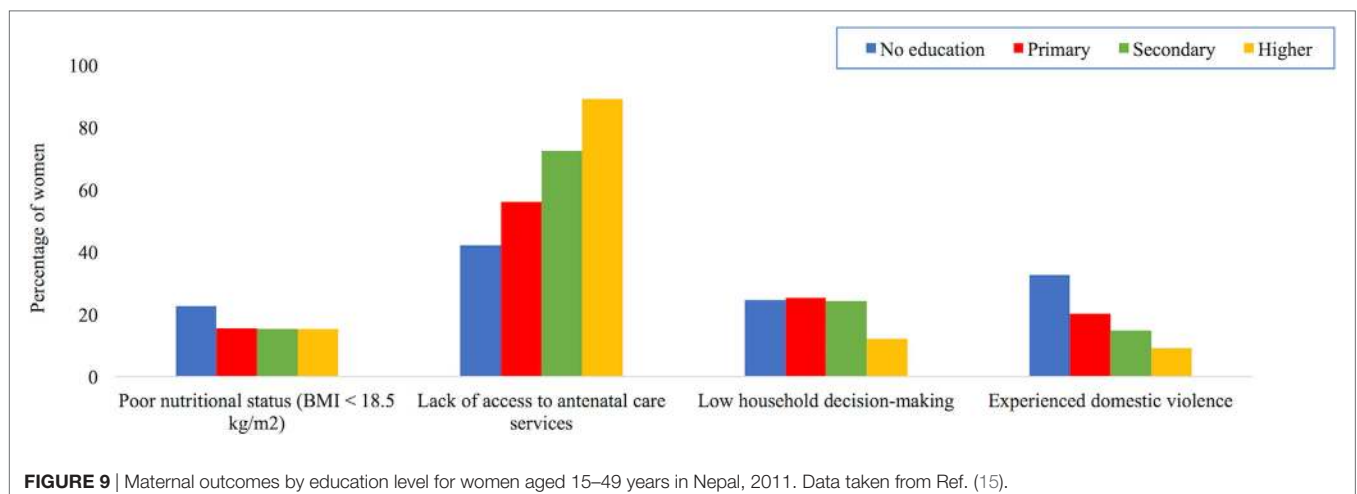


FIGURE 9 | Maternal outcomes by education level for women aged 15–49 years in Nepal, 2011. Data taken from Ref. (15).

Education, and by association the level of schooling completed, are crucial for public health because they are perceived to provide the knowledge, confidence, and agency required to make informed decisions related to maternal and child health, nutritional status, and survival (85). Greater levels of maternal education and literacy are expected to improve the ability of mothers to access and demand appropriate services in support of better growth and development of their children (86, 87). For example, mothers who participated in women's groups across South Asia not only improved their literacy, but were also able to use information on maternal and child nutrition and healthcare to decrease the proportion of children born with LBW (88, 89). Education is also considered to facilitate greater autonomy to negotiate new and less gendered roles in society, age at marriage, and childbearing (13). Maternal ability to adopt behaviors that children need, including early stimulation, is also expected to be enhanced with greater years of schooling (90). Presumably, greater paternal educational attainment may lead to similar positive outcomes. However, data to compare the independent associations of parental education with daughter's age at marriage are not routinely collected in studies.

Empowerment and Autonomy

Together, lack of education and under-age marriage contribute to lower empowerment for women at the individual level throughout the life-course (91). Husbands and mothers-in-law may exert greater control over younger women, who, being less educated, may be less able to assert themselves (92). Das Gupta terms this subordinated position of young mothers, especially in joint families, as "double powerlessness" (93). Being female and of a younger age limits their ability to exercise autonomy during their childbearing years. For example, young mothers' lack of control over their own fertility increases the risk of numerous negative maternal reproductive health and child-survival outcomes (94).

Domestic violence is another aspect of low empowerment related in part to young women's lower ability to resist and refute. Compared with women who married after 18 years, those married under-age are more likely to experience physical or sexual violence (95). For example, interviews with 8,314 young women aged 20–24 years across five Indian states with the highest prevalence of under-age marriage⁴ found women married after 18 years of age were 1.24 times less likely than women married under-age to accept physical violence, and approximately 0.6 times less likely to have experienced marital physical or sexual violence (96). Another analysis of DHS data on women aged 25–49 years from Bangladesh, India, Nepal, and Pakistan over the past two decades also finds that women who married at a younger age were more likely to experience violence than those who married at an older age (16).

There is likely to be a two-way association between early marriage and poor mental health, and together, these factors have knock-on effects on a range of adverse maternal and child outcomes (97). Broadly, research finds that adolescence is a crucial developmental stage, with 50% of mental disorders presenting by

the age of 14 years (98). Girls who marry during adolescence are also more likely to be experiencing the physical and emotional effects of pubertal change, which have their own implications for mental health (99). Early marriage and childbearing, along with gynecological morbidity related in part to pregnancy-related factors are likely to further stress mental well-being (100). This overall "gendered disadvantage" in social roles and status experienced by women has been associated with common mental issues such as depression, stress, and other neurotic disorders (97, 101). For example, a cross-sectional survey from 2001 to 2003 of 3,000 women aged 18–45 years in Goa, India found indicators of gender disadvantage such as an early age at marriage and childbearing, low levels of decision-making autonomy, family support, and sexual violence by husbands increased the prevalence of mixed-anxiety depressive disorder (102). Another qualitative sub-study of the rural Pune Maternal Nutrition Study conducted 12 separate focus group discussions with young mothers and fathers, grandmothers and grandfathers in 1998 (103). It found that young mothers had poor nutritional status and experienced anxiety and depression because their minimal influence over the allocation of resources restricted access to health services, and social isolation prevented them from caring for their children's health and education. Studies also find that violence experienced in marital homes is related to mental ill-health, including women practicing self-immolation (104).

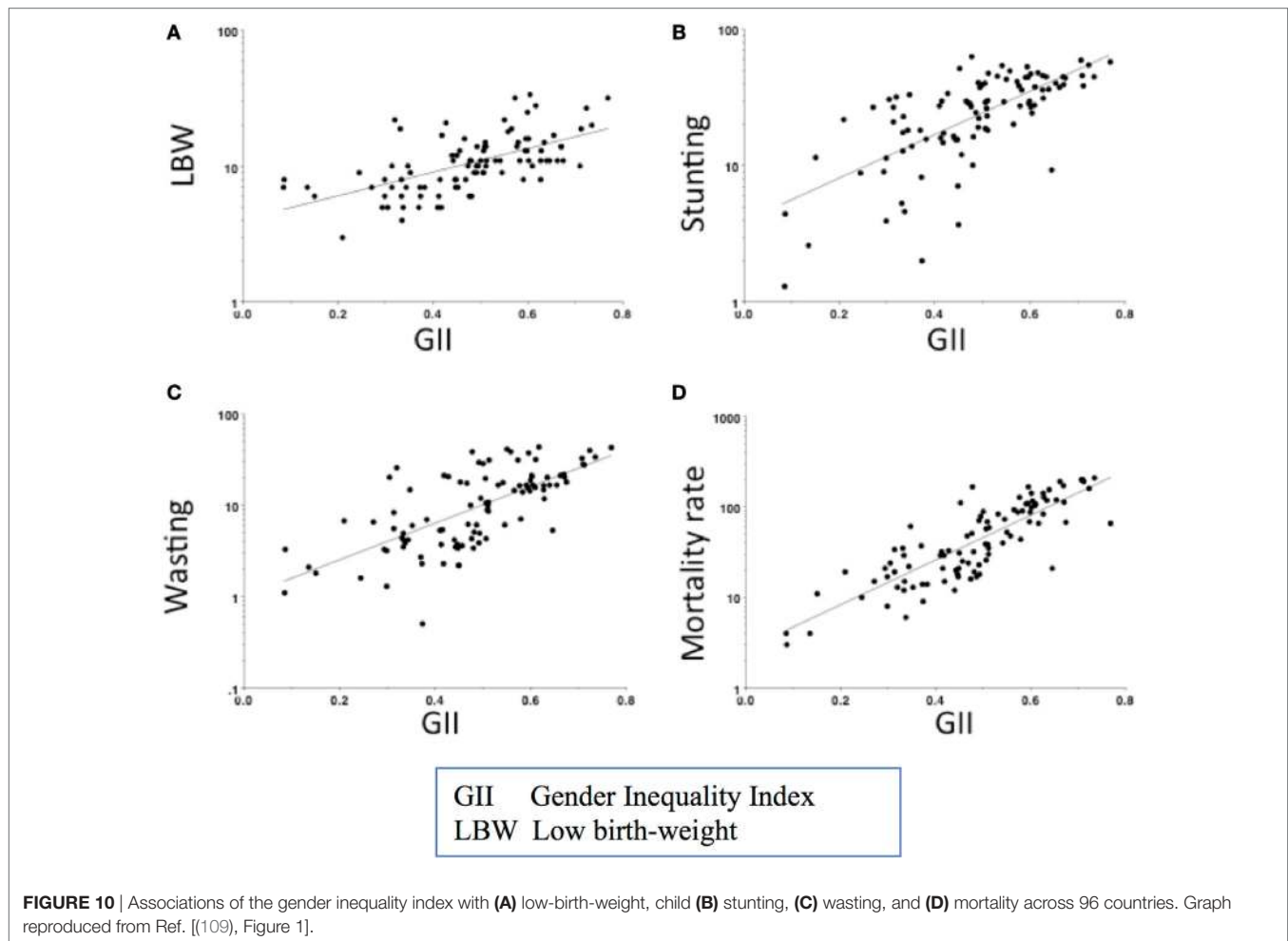
Low Social Status

Age at marriage is likely to shape women's empowerment and agency within households and their status in the broader community. Studies find that the younger a woman marries, the more likely she is to have lower status in each of these hierarchies (105). Smith et al. (106) estimated that if women had equal social status to men in households and communities, the prevalence of underweight children under 3 years in South Asia would decrease by 13.4 million (13%).

At the broader level of society, gender norms and practices also shape the social institutions that structure daily life, including health care and education. Studies have found that women's lower social status relative to men, as measured by the gender inequality index (GII)⁵, has adverse associations with infant and child mortality and malnutrition (108, 109). The four South Asian countries included in this review rank low on the GII. In 2015, out of 188 countries, they ranked 119 (Bangladesh), 125 (India), 115 (Nepal), and 130 (Pakistan) (107). They also had high rates of child mortality and malnutrition (110, 111). **Figures 10A–D** show data produced by Marphatia et al. in 2016 on the associations of GII with LBW, child malnutrition, and mortality across 96 countries (109). This study found societal gender inequality explained 36% of the variance in LBW. The GII was also more predictive of LBW than national wealth, measured by per capita Gross Domestic Product (GDP). Independent of GDP, GII also

⁵The Gender Inequality Index is a composite statistic of the loss in potential human development due to disparities between female and male achievements in empowerment (secondary educational attainment and parliamentary representation), economic status (labor market participation), and women's health (adolescent birth rate and maternal mortality ratio) (107).

⁴Andhra Pradesh, Bihar, Jharkhand, Maharashtra, Rajasthan, and Tamil Nadu.



explained 10% of the variance in wasting (low weight-for-height) and stunting, and 41% of the variance in child mortality.

Simulations suggest that reducing societal gender inequality would benefit child outcomes most strongly in the poorest countries. Shifting from the 90th to 50th GII centile in a poor country (10th centile of GDP) would decrease the prevalence of LBW by 4%, stunting by 10%, and childhood mortality by 54% (109). To achieve similar gains through economic growth alone, these low-income countries would effectively need to become middle-income, shifting to the 50th centile of GDP.

The social consequences of under-age marriage are likely to accumulate over time, reducing the very maternal phenotypic components that are key to maternal and child development and health outcomes. Next, we review whether certain factors predispose girls to marrying early. We consider why the practice of under-age marriage continues despite growing evidence of its trans-generational consequences.

PREDICTORS OF UNDER-AGE MARRIAGE

In the previous section, we have noted that some of the negative outcomes for under-age brides and their children might operate through relative socio-cultural disadvantage. In the following

section, we discuss the ways in which these factors can lead to under-age marriage in the first place.

Socio-Cultural Factors

Each of the four South Asian countries included in this review has complex cultural dynamics that might underlie overt preferences for women's under-age marriage. We highlight key themes from diverse literature on women's marriage age rather than providing a detailed account of each country's social context. However, we do use country-specific examples to illustrate key points.

Studies across different disciplines refer to the "socio-cultural norms, customs, and beliefs" shaping decisions relating to marriage age. Studies often use a "cost-benefit" framework to explain the "trade-offs" or penalties for marrying daughters at a particular age. However, Bicchieri et al. point out that many studies do not clearly define the term "social norms," suggesting instead that "moral rules" better describe how behavior relating to marriage age is governed in societies (112). These codes of conduct and beliefs over credible life options lead people to conform to normative social preferences relating to the age at which girls should marry.

Here, the anthropological literature is helpful in further explaining the significance of the normative beliefs underpinning

the practice of early marriage. Kneller defines “culture” as custom, and “societies” as people practicing the customs (74). Both of these aspects play critical roles in the forming of personality because culture is largely internalized and modified by individuals depending on the agency available to them (74). In his seminal anthropological study, Marcel Mauss argues that the person cannot be detached from their broader social structures, hierarchies (socio-economic and gender), and caste/class systems (113). The point, as Vaitla et al. also argue in their 2017 review paper, is that norms and behaviors relating to expected (unequal) social roles and status are deeply rooted in local culture, which in part also shapes individual identity (114). For example, a study conducted in 1990 of 13,200 daughter–mother dyads across 14⁶ Indian states found the sense of “self” was in part shaped through interactions with various familial, socio-economic, and ecological factors (115). This collective formation of individuals may serve to maintain, rather than challenge, prescribed gender norms.

Within this context of South Asia's collective societies, people, and their actions are perceived to be socially embedded. Here, studies suggest that as long as families (as opposed to the welfare state) are the main providers of social protection for women, social norms are likely to continue to influence the age at which women marry (116, 117). Broadly speaking, the role and primary identity of a woman in such social contexts are defined by her purpose in life as a “wife, daughter-in-law, and mother.” Hence, the principal “option” in life for women may be marriage. Social norms will thus continue to shape the age at which this is likely to occur and will also influence other opportunities in life such as education.

Historical records suggest that girls' under-age marriage is not a new phenomenon in contemporary South Asian society. For example, in India, the practice of child marriage, or *Kanya Dan* (gift of a daughter, in Sanskrit), and the social importance and familial pride and prestige attributed to it, is believed to originate in Hindu religious texts (Dharmasutras and Smritis) in 600 AD. These scriptures warned of the social and religious consequences for parents who failed to marry their daughters soon after menarche [Kapadia DM 1966 cited in Ref. (19)]. The custom of under-age marriage may also originate from socio-cultural practices with patrilineal households desiring to assimilate women from other families into their households [Karve I 1965 cited in Ref. (19)]. An early age at marriage may ensure a bride's loyalty to her husband's family. In turn, she would be bound by these very ties. Her low level of education, autonomy, and empowerment may also contribute to shaping her behavior in her marital home. A broader spousal age-gap would also facilitate this “character molding” of younger brides, who are likely to be more responsive to these practices (92).

Whether the practice of under-age marriage in South Asian societies overtly relates to these historical religious dictats is not always clear. However, there is evidence that marrying “early” may be perceived to have benefits whereas marrying “too late”

may have social consequences for not only girls but also their families. Several studies provide support for what Maertens terms as the social “institution of early marriage” (p. 1) (118). Caldwell et al.'s 1980 study of 5,000 women in rural Karnataka, India found that although there was a slow shift away from very young child marriages, parents still married their daughters before 18 years because socially this cleared the way to find a bride for their son (17). Maertens, in her 2007–2008 study of over 1,800 individuals in three villages across Maharashtra and Andhra Pradesh states in India finds that failing to adhere to the perceived “ideal” age of marriage (<18 years) in the wider community may lead to criticism and social exclusion which eventually impacts the marriageability of other children, especially girls, in the household (118).

Studies also find that menarche and signs of physical development precipitate under-age marriage because of parental perception of “readiness for marriage” (9, 76). This perception may be related to the expected virginity of prospective brides, which continues to be considered a hallmark of respectability across religions. It is the definition of a “good woman” and hence a necessity for marriage. Virginity may thus be perceived to be in greater “jeopardy” after menarche when the onset of sexual maturity is considered to incite unwanted male attention, risking promiscuity, and sexual violence (76, 119). Under these circumstances, families may face losing their “honor” and girls may be considered unmarriageable, thereby imposing further, long-term burdens on households to provide care for their daughters. As explained in the previous section, the key concern for public health is that girls who marry young may not be physiologically ready for early pregnancy and childbirth.

Collectively, these studies suggest that the agency that is used to support the practice of under-age marriage can be understood as the “socially significant quality of action” (120). Delaying women's marriage age will invariably require changing the norms underpinning the practice of early marriage and also the low status accorded to women in society. Here, Del Franco's study in rural Southwest Bangladesh finds that tertiary education accords girls the self-confidence to negotiate a delay in the age at which they marry (121). She argues that we need “...a more nuanced meaning of social embeddedness...to acknowledge that girls are not just passive enactors of other people's interests and desires” (p. 161) (121). While this suggests a shift in social norms, there may be a selection bias in the sample; the girls who attend university are more likely to come from families who are more supportive of education and delaying women's marriage age.

These aspects of agency and socio-cultural mores are difficult to measure and compare across women, communities, or countries. Nevertheless, in quantitative studies, culture is reflected in several variables. These include religion, ethnicity, caste, and socio-economic status, all of which may shape social beliefs and behaviors around education, marriage age, fertility, autonomy, etc. (115). **Table 1** shows that religion partly shape national law relating to minimum marriage age. However, inferring that any one faith is related to the persistent practice of under-age marriage is difficult because girls appear to be married under-age in all religions. A review of 111 countries found that the prevalence of under-age marriage varied greatly, with no discernable pattern by the countries' predominant religions (122). This is not to say

⁶Andhra Pradesh, Bihar, Delhi, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, and West Bengal.

religion is not a predictor of under-age marriage, but rather that it is often tightly interwoven with broader gendered socio-cultural norms, attitudes, and practices.

Economic Factors

The economic wealth of families, which is often related to socio-cultural status, is a common factor cited in the literature on the predictors of under-age marriage. A recent review of 54 DHS surveys found that girls living in poor households were twice as likely to marry before the age of 18 years when compared with girls in wealthier households (123). MacQuarrie's analysis of recent DHS data on women aged 25–49 years from Bangladesh, India, Nepal, and Pakistan also finds that women's age at marriage increases in line with household wealth (16). The United Nation's Population Fund's 2012 analysis found a similar trend in the contemporary younger cohort of women aged 20–24 years. The proportion of women marrying under-age decreased as household wealth increased (9). **Figure 11** shows the prevalence of under-age marriage by wealth quintiles in South Asia (9). The poorest quintile describes the percentage of women aged 20–24 years from the poorest 20% of households, who were married or in union before their 18th birthday.

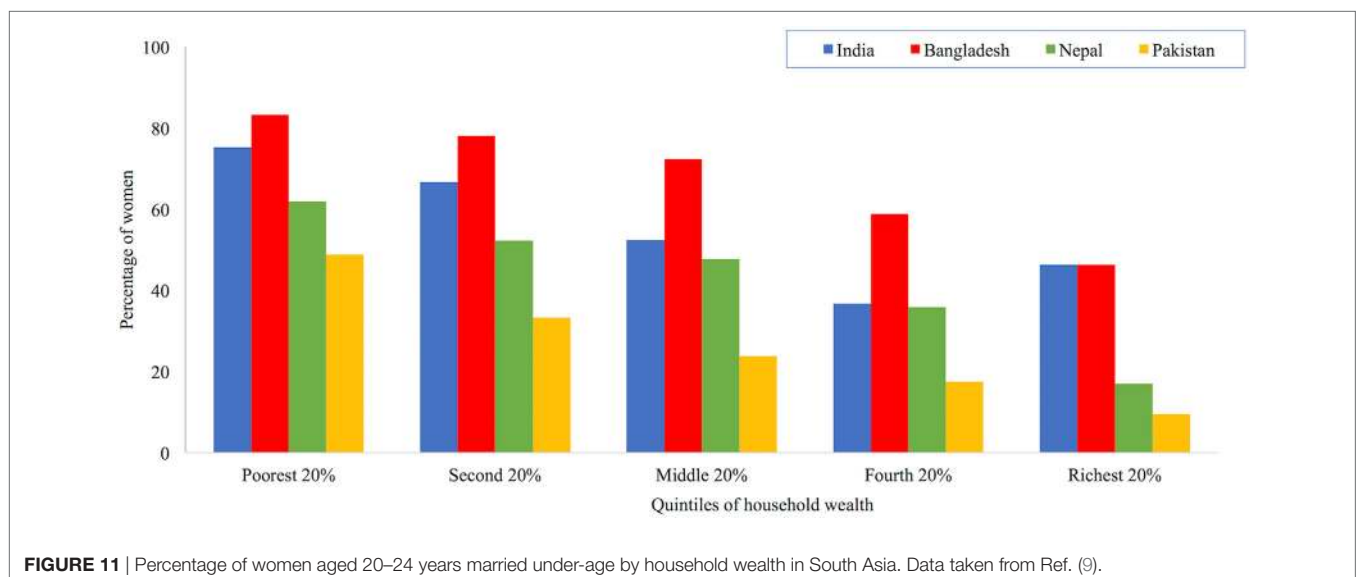
Why are households of low-economic status more likely to marry girls at an earlier age? Studies suggest that in resource-constrained households, girls may represent a liability for the limited economic budget and food security for the entire household; the sooner these responsibilities are passed onto the husband's family the better (19). Douglas (124) explains that in patrilineal societies where family lineage and livelihood depends on sons, more resources are amassed for their development and educational/social advancement. To achieve this, less money is spent on daughters' education, healthcare, and eventual marriage and dowry (118). However, in South Asian societies, the wealth-marriage age association is complex. Even girls from middle-income families may be "moved on to" their marital homes as early as possible. This is because dowry, which is paid by the

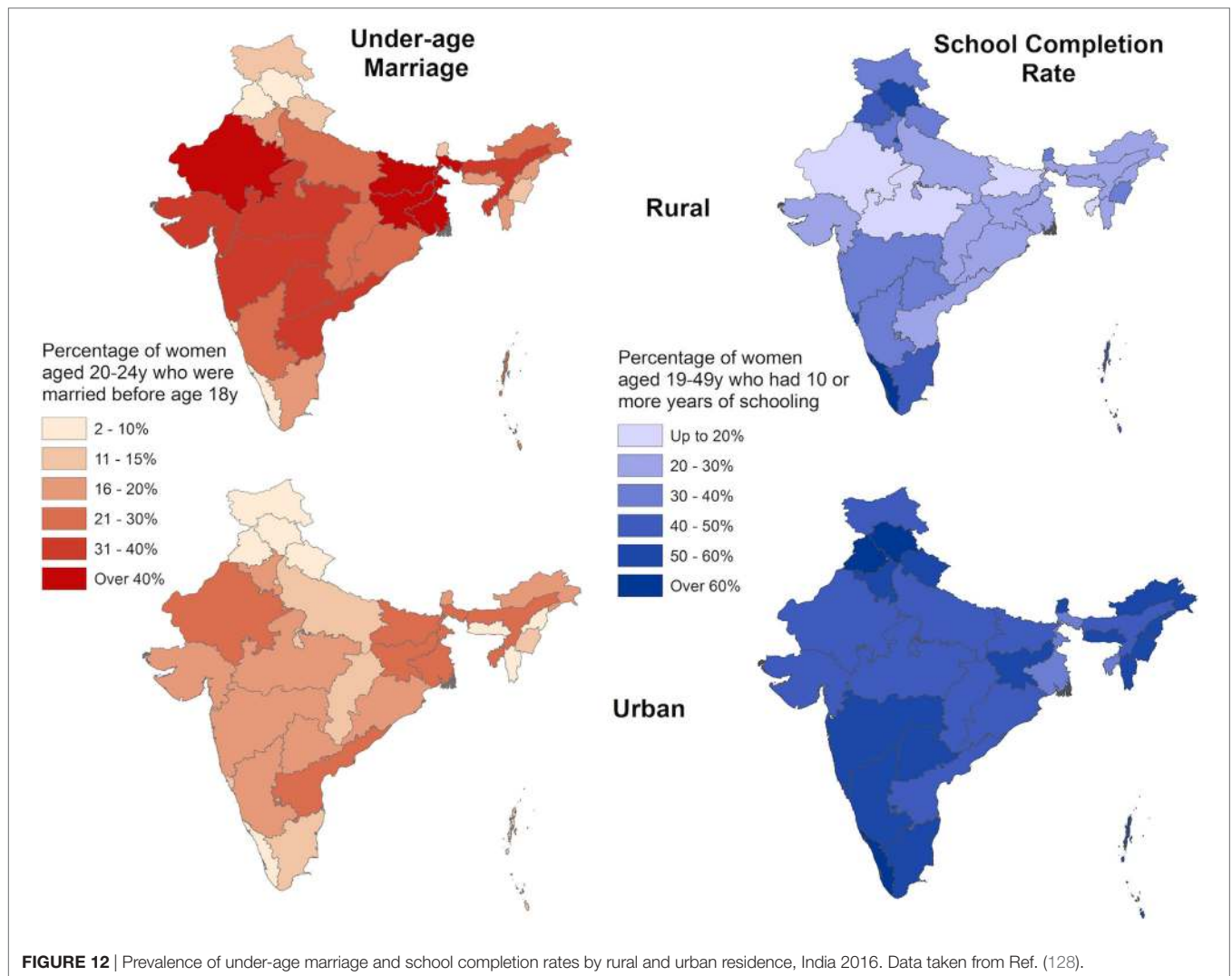
woman's family, increases with the prospective bride's age, and education level (125). Since the practice of dowry has been illegal since 1961, official data on payment amounts are generally not collected. However, the 2011–2012 Indian Human Development Survey of 42,000 households estimated that the average Indian family gave 30,000 Rupees (approximately \$491) in cash for dowry; about 40% also gave televisions and cars (126).

Rural Residence

There is geographic heterogeneity in the prevalence of under-age marriage across and within countries. Compared with women in urban areas, those residing in rural areas are generally more likely to come from poorer households, to be married under-age, and to have lower educational attainment. An analysis of 36 Sub-Saharan and South West Asian countries found that women from rural communities who had married early had the greatest deficits in schooling (127). **Figure 12** uses data from the recent 2016 National Family Health Survey in India to illustrate that the prevalence of under-age marriage in India is higher in rural than urban areas, especially where the rate of girls schooling has historically been the lowest (128). A similar pattern is found in Bangladesh, Nepal, and Pakistan. Girls residing in rural areas in these three countries also have a higher risk of marrying under-age than their urban peers (9, 129).

Overall, the different predictors of under-age marriage that have been reviewed thus far appear to have a greater rural concentration. There is usually lower availability and access to schools in rural areas (130). This may hasten under-age marriage. Another factor may be the rural economy, which may offer fewer formal employment opportunities to women. Rural areas also tend to have a greater proportion of informal or home-based industries, where young, often uneducated brides are sought to provide labor for free (75). Family farms, upon which these young women also work, contribute to household food security with few economic costs to the household. Furthermore, in poor rural areas where infant mortality is high, young women with longer reproductive





careers are particularly sought after to maximize the number of surviving offspring to satisfy household requirements for labor (75).

These factors are also embedded within the broader socio-geographical hierarchy of rural societies, which studies find are more likely to uphold traditional practices of early marriage (131). Singh et al. (96) use Indian NFHS data (2005) on 40,606 women aged 15–59 years from the eight⁷ states with the highest prevalence of under-age marriage and population growth but lowest levels of social and economic growth to identify correlations between different factors. They found rural residence and education level explained 83% of the variability in marriage age. Other factors mapped onto these two predictors. Poorer, lower caste families who tended to reside in rural areas were less likely to educate their daughters and more likely to marry them under-age.

⁷Bihar, Uttar Pradesh, Madhya Pradesh, Rajasthan, Orissa, Jharkhand, Uttrakhand, and Chattishgarh.

Education

It is often assumed that although marriage and education are alternative life outcomes for adolescents, marriage largely shapes education in that girls who marry young are forced to leave school. However, there is likely to be a bi-directional association between marriage age and education. Education may also predict the age at which women marry. The role of girls' education in shaping the timing of key life events such as age at marriage and childbearing is complex. Paradoxically, studies find both fewer and greater years of schooling are associated with under-age marriage. Below, we discuss why these different pathways shape greater susceptibility to under-age marriage.

Overall, data from 2010 to 2014 show that the net enrollment rate (NER)⁸ for girls in primary school was around 94% for India, Bangladesh, and Nepal and 67% in Pakistan (133). However, the

⁸The number of pupils of official school age who are enrolled in education as a percentage of the total children of the official school age population (132).

NER for secondary school was much lower, at 62% in India and Nepal, 55% in Bangladesh, and 36% in Pakistan (133).

Studies estimate that across 18 of the 20 countries with the highest prevalence of under-age marriage, girls with no education were up to six times more likely to marry as children than girls with secondary education (75). In India, each additional year of education, from primary school onward, reduced the risk of under-age marriage (17, 69). In Bangladesh, Nepal, and Pakistan, there appears to be a “threshold effect” with secondary education being associated with delaying marriage age during early- but not late-adolescence (69). Bongaarts et al.’s analysis using DHS data from 1996 to 2014 for 43 countries including the South Asia region found that the difference in the mean age of first sexual intercourse, marriage, and childbearing is greater between girls with secondary and primary education than the difference between girls with primary and no education (13). This study also found that the overall increase in the educational attainment of girls was accompanied by slower than expected increases in the age at which girls experienced these key life events (13).

Dropping out of school because of poor performance may also increase the probability of under-age marriage, because households may be less likely to invest limited resources in keeping girls in school (127). Of course, leaving school need not necessarily have to be associated with under-age marriage, unless socio-cultural norms imply a “choice” in life between education and marriage.

Poor performance in school may not necessarily be a marker of academic ineptitude. Studies from Bangladesh, India, and Nepal find the lack of available, accessible, acceptable, and adaptable education of good quality may function as a “push factor” for both low educational attainment and an earlier age at marriage (134, 135). Aikman and Rao find that in school girls are often encouraged to fulfill gendered societal roles of early marriage and childbearing (136). Similarly, Jeffrey and Jeffrey’s (137) study raises important questions about the potential failure of education in transforming gendered social roles,

...How can sending girls to school for a greater number of years empower them if the structures of domination in which they are embedded remain unchanged? Does schooling really expose girls to alternatives permitting them to challenge this hegemony and realm of ideas? (p. 161)

The demands of the contemporary marriage market in South Asia suggest the emergence of a new trend. Higher levels of education are not substantially delaying girls’ marriage age. In this context, education becomes an asset for marriage (138). Research suggests that completing secondary school (age 17 years) enhances the social position of girls and also their families by improving the chances of marrying into a family of higher socio-economic status (hypergamy) (139, 140). A higher level of education is increasingly sought after by the bridegroom’s family because it is perceived to be a sign of greater maturity and capability during the eventual reproductive years (84). Paradoxically, staying longer in school, where gendered roles are emulated by teachers

and peers, may perpetuate societal norms of under-age marriage (136, 137).

These contrasting findings suggest we need to better understand what girls can do with increased education in societies where other life opportunities, such as higher education or employment, are not yet widely acceptable or accessible to most women (141). Greater education may also not be improving women’s status at the household or societal level. For example, if the education of girls is principally valued as a social asset for obtaining a future husband, then staying in school longer may not increase agency or change the gendered ideals of marriage (142, 143). Paradoxically, recent evaluations of cash stipend interventions to delay girls’ marriage age through increased education in Bangladesh found they were used by families to pay for marriage-related costs (144, 145). This included higher dowries amounts associated with the higher education levels of girls. These programs did not change the lower value attributed to girls in society and their restricted domestic social roles (145).

Women’s Low Social Status

As with education, women’s subordinated status in society can be both a predictor and a consequence of under-age marriage (146). Socio-cultural practices are likely to reproduce gender unequal power relations and maintain women’s subordinated status (19). However, notions of gender inequality are complex in South Asian societies. Asymmetries of power lie not only along male–female lines but also among females of different ages, and possibly also varying levels of education (147). Young brides usually have the lowest social status in households (93, 148). Mothers-in-law generally have more authority to put into practice decisions about health care, education, and expenditures, although the primary decision-making tends to remain with men (148). Chodorow explains that it is within this larger context of patriarchy that a microcosm of women being agents in their own subordination takes places (147). In traditional contexts such as rural Bangladesh, where gender inequality persists, Bates et al. (81) find that

...empowerment may sometimes enable women to carry out traditional strategies that reflect their fundamental social and economic insecurity in the family and in society at large [;] strategies that may undermine the health and well-being of women in the next generation. (p. 109)

We still need to better understand why female family members who may have experienced adverse consequences of their own under-age marriage may encourage reproduction of the same pathways for their own daughters and daughters-in-law. The difficulty here for researchers is that women’s status is likely to change over their life-course. It may paradoxically lead to the transition from one of subservience to husband to dominance over her own daughter-in-law. Of course, women of all ages may find the agency to resist these norms, but often only within the limited discursive spaces available to them (149).

Here, systematic reviews of interventions show that laws and communication with community members on the consequences

of early marriage are a necessary but insufficient condition for delaying marriage age (150). This may be because social norms related to marriage age are changing very slowly. Delprato et al. (127) find that household decisions to marry daughters under-age reflect socio-cultural norms passed on through generations by social pressure to maintain the *status quo*. Their analysis of DHS data from 36 countries in Sub-Saharan Africa and South West Asia finds that girls are more likely to marry under-age when the community also has high rates of past and current marriages of women below 18 years, high fertility, and low levels of pre-marital sex (an indication of the value the community attaches to girls' virginity and reflecting safety concerns related to early marriage decisions).

At a societal level, policies which are formal institutionalized arrangements of socio-cultural norms may maintain these practices and women's subordinated status. The widespread neglect of women's health and nutrition in national policies not only harm women themselves, but also impose a burden on wider society by contributing to long-term, often trans-generational deficits in health and human capital (151). Since culture is also about how different parts of society are organized, including the structures that uphold them, schools play an important role in enabling the formation of societies along these norms (136). In the widest sense, education includes this very process of forming a person's mind and character. However, many studies argue that schools often serve to reproduce, rather than challenge, existing gendered norms in societies (152).

In summary, although education and, to some extent, economic opportunities for women are more widely available, countries with deeply entrenched traditional justifications for early marriage are not likely to see an end to this practice without a shift in gendered social norms (153). The inter-relatedness of these factors is complex. Families may be caught between

status attainment through idealized gender performance where modesty, segregation, and under-age marriage are praised and modernity, where greater education and later age at marriage are emphasized (154). This makes identifying the key levers of change all the more challenging.

DISCUSSION

While the importance of under-age marriage is recognized in different academic and policy fields, they also approach the problem from contrasting perspectives. The demographic and public health literatures focus largely on the disadvantages of early child-bearing. Conversely, social scientists focus on the human capital consequences of under-age marriage, such as education. These different approaches miss the inherent inter-connection between these issues and the implications for public health of the broader social challenges.

Our goal in this review has been to draw on these diverse literatures to provide an integrated perspective on variability in women's marriage age and its implications for public health (Figure 13) (129, 155, 156). Taken together, these factors are markers of women's low status in society and are likely to have trans-generational consequences. We conclude by discussing some of the implications for research and practice for better understanding the predictors and consequences of under-age marriage in the context of public health.

Implications for Research

A recent expert group meeting organized by the UN, charity organizations, and academics recognized the need for more research on factors *beyond* gendered norms, education, and poverty contributing to under-age marriage (157). Our review of

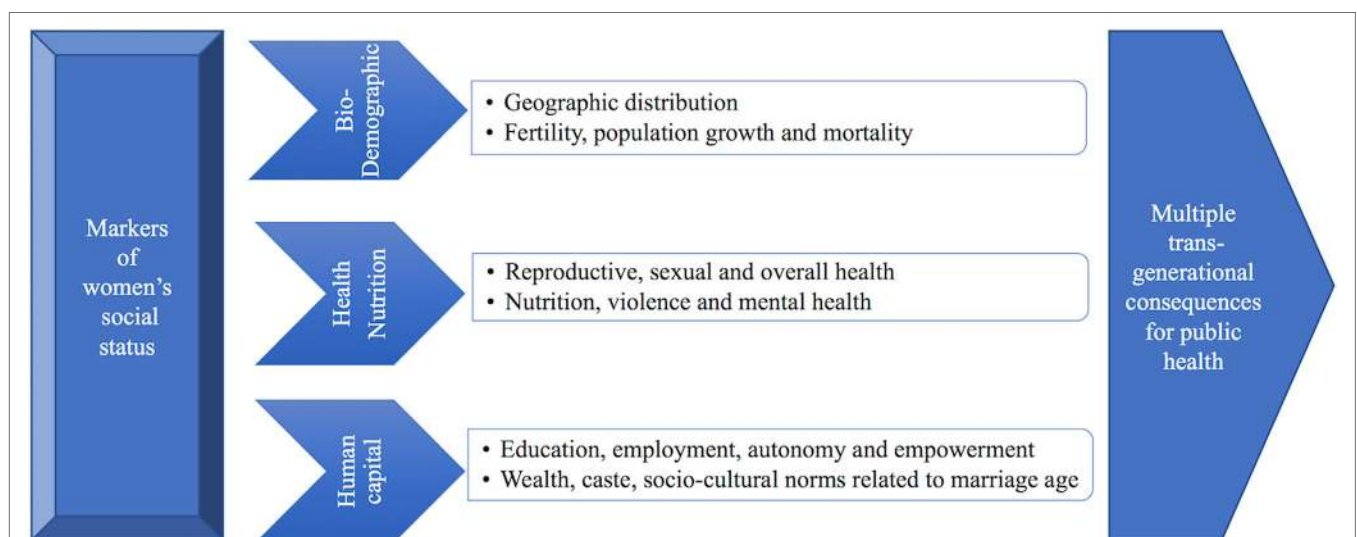


FIGURE 13 | Schematic diagram illustrating the public health implications of women's under-age marriage. Taken together, these physiological, bio-demographic, and socio-environmental drivers of variable marriage age are markers of women's low social status. These factors have an adverse effect on women, mothers, and their children. They have a major impact on public health. Adapted from Ref. [(129), Figure 1; (155), Figure 1; (156)].

the literature suggests this would require both a broader scope to research and also different methodological approaches. Research needs to focus on the predictors of *variability* in marriage age to identify the trade-offs of marrying at different ages. This is crucial because factors that contribute to a later marital age may not simply be the inverse of those associated with under-age marriage. Take, for example, the increased participation of girls in education, which has not yet substantially delayed their age at marriage.

Decisions about future life paths, be they education or marriage, are not likely to suddenly appear at one point in time. Such decisions about choices in life may also emerge through cumulative social and biological processes (158). For example, biomedical scientists find a “developmental origins” to adult non-communicable disease and less education (159, 160). Whether factors acting in early life also shape variability in women's marriage age requires further investigation. Studying these complex associations would require a multi-disciplinary life-course perspective and data on two if not three generations.

A key methodological challenge is disentangling the key drivers of variability in marriage age. Under-age marriage is a marker of several inter-related gender-specific vulnerabilities relevant to public health such as less education, poor nutritional status, and poverty, all of which are concentrated in rural areas (12). There is also a strong correlation between the individual, household, and demographic variables predicting marriage age. The potential bi-directionality and multiple pathways of these associations also renders identification of the predictor and consequence difficult (45). For example, maternal age at childbirth, which is predicted by under-age marriage, is associated with infant mortality; these associations may operate through socio-economic deprivation and biological behavioral factors such as place of delivery, gestation, and birth-weight (59, 71). But socio-economic deprivation and biological behavioral factors may themselves predict under-age marriage.

Another key challenge is comparing and compiling evidence across studies because of their different age categorizations, time frames, and data disaggregation. Furthermore, changes in ecological, economic, and socio-cultural factors during these time periods may not provide an accurate representation of a potential change in the timing of marriage (131). Some factors may also be more important at specific time periods or have a stronger association over time, or the risk related to any type of consequence may accumulate over time. Finally, observational analyses of nationally representative surveys indicate conditional statistical correlations, but they cannot prove causality.

Implications for Practice

Policies have had some success in decreasing the rate of adolescent fertility (161) and increasing girls' participation in education (130), both of which are relevant for public health. Estimations suggest

the enforcement of even existing contrasting laws on minimum marriage age in South West Asia would increase girls' schooling by 15% (127). However, increased education, the primary intervention used to delay girls' marriage age, has had limited success (69). Similarly, systematic evaluations of interventions suggest efforts directly aiming to delay marriage age are more successful than those focusing on related factors such as adolescent sexual and reproductive health, partly because girls have little control over access to these services before and after marriage (162, 163). We do however know that at an individual level, in circumstances where mothers have greater ability to make strategic life choices, and the autonomy, agency, and access to resources required to exercise these choices, children's nutritional status and health have generally improved (89, 164).

Conclusion

Our aim was to show that women's marriage age, and its human capital predictors and consequences, matter for public health. We argue that a broad range of health and social issues, including the low status of women, are likely to be affected by addressing early marriage. Marriage is both a cultural practice, reflecting women's status in society, and linked to multiple biological, ecological, and geographical factors, each of which is crucial for public health. Marriage is the “gateway” to the multiple health consequences associated with the timing of childbirth. It is also a predictor of human capital penalties, which have their own implications for health. The gaps identified in knowledge and the general ineffectiveness of policies and interventions help explain why the early age at which girls marry is both expected and accepted, and why it changes very slowly (165). Disentangling the broad predictors of marriage age is complex. They are inter-related, and tightly interwoven with socio-cultural norms, broader economic and geographical contexts, and trans-generational developmental processes (123, 166).

AUTHOR CONTRIBUTIONS

AM conceived the original idea and developed it with guidance from AR and GA. AM wrote the first draft of the article. AR wrote sections on demography, maternal, and child survival. GA produced the maps and their interpretations. All authors provided detailed feedback on the full manuscript and contributed to revisions.

FUNDING

The bulk of work for this article arises from AM's Ph.D. Thesis, which was fully funded by the Economic and Social Research Council (ESRC) Doctoral Training Centre, University of Cambridge.

REFERENCES

1. UN General Assembly. *Resolution on Early, Child and Forced Marriage*. New York, USA: UN General Assembly (2014). Report No.: 68/148.
2. UN General Assembly. *Universal Declaration of Human Rights*. 217 A (III) New York, USA: UN General Assembly (1948).
3. UN General Assembly. *Convention on the Rights of the Child*. New York, USA: UN General Assembly (1989).

4. Lloyd C, editor. *Growing Up Global: The Changing Transitions to Adulthood in Developing Countries*. Washington, DC, USA: National Academy of Sciences (2005). 721 p.
5. UNFPA. *Report of the International Conference on Population and Development, Cairo*. Cairo, Egypt: UNFPA (1994). Report No.: A/Conf/171/13.
6. Melchiorre A. *A Minimum Common Denominator? Minimum Ages for Marriage Reported under the Convention on the Rights of the Child. Submission on Child, Early and Forced Marriage to Women's Human Rights and Gender Section*. Geneva: OHCHR (2013).
7. UN General Assembly. *Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW)*. New York, USA: UN General Assembly (1979).
8. UNICEF. *Ending Child Marriage: Progress and Prospects*. New York, USA: UNICEF (2014).
9. UNFPA. *Marrying Too Young: End Child Marriage*. New York, USA: UNFPA (2012).
10. UNICEF. *Global Database on Child Marriage*. UNICEF (2016). Available from: <https://data.unicef.org/topic/child-protection/child-marriage/>
11. UNICEF. *State of the World's Children 2016: A Fair Chance for Every Child*. New York, USA: UNICEF (2016).
12. Mensch B, Singh S, Casterline J. Trends in the timing of first marriage among men and women in the developing world. In: Lloyd C, Behrman J, Stromquist, N, Cohen B, editors. *The Changing Transitions to Adulthood in Developing Countries: Selected Studies*. Washington, DC, USA: National Academies Press (2005). p. 118–71.
13. Bongaarts J, Mensch BS, Blanc AK. Trends in the age at reproductive transitions in the developing world: the role of education. *Popul Stud* (2017) 0(0):1–16. doi:10.1080/00324728.2017.1291986
14. NIPS/Pakistan, ICF International. *Pakistan Demographic and Health Survey 2012-13*. Islamabad, Pakistan: NIPS/Pakistan and ICF International (2013). Report No.: FR290.
15. MOHP Nepal, New Ear, ICF International. *Nepal Demographic and Health Survey 2011*. Kathmandu, Nepal and Calverton, MD: Ministry of Health and Population (MOHP) [Nepal], New ERA, and ICF International Inc. (2012). 396 p.
16. MacQuarrie K. *Marriage and Fertility Dynamics: The Influence of Marriage Age on the Timing of First Birth and Birth-Spacing*. Rockville, MD: ICF International (2016). Report No.: 56.
17. Caldwell J, Reddy P, Caldwell P. The causes of marriage change in South India. *Popul Stud* (1983) 37(3):343–61. doi:10.2307/2174503
18. Kashyap R, Esteve A, García-Román J. Potential (Mis)match? Marriage markets amidst sociodemographic change in India, 2005–2050. *Demography* (2015) 52(1):183–208. doi:10.1007/s13524-014-0366-x
19. Bhagat RB. *The Practice of Early Marriages among Females in India: Persistence and Change*. Mumbai, India: IIPS (2016). Report No.: 10.
20. NIPORT/Bangladesh, Mitra and Associates, ICF International. *Bangladesh Demographic and Health Survey 2014*. Dhaka, Bangladesh: ICF International (2016). Report No.: FR311.
21. IIPS. *NFHS-4 Key Findings (2015-16)*. Mumbai, India: IIPS and Ministry of Health and Family Welfare, Government of India (2016).
22. Raj A, McDougal L, Rusch M. Changes in prevalence of girl child marriage in South Asia. *J Am Med Assoc* (2012) 307(19):2027–9. doi:10.1001/jama.2012.3497
23. UN Human Rights Office of the High Commissioner. *Ratification Status by Country. Ratification Status of Treaties by Country* (2017). Available from: http://tbinternet.ohchr.org/_layouts/TreatyBodyExternal/Treaty.aspx?CountryID=14&Lang=EN
24. Girls Not Brides. *United Nations General Assembly Adopts Resolution on child, Early and Forced Marriage* (2013). Available from: <http://www.girlsnotbrides.org/united-nations-general-assembly-adopts-resolution-on-child-early-and-forced-marriage/>
25. United Nations. *Convention on Consent to Marriage, Minimum Age for Marriage and Registration of Marriages*. United Nations Treaty Collection (2017). Available from: https://treaties.un.org/Pages/ViewDetails.aspx?src=IND&mtdsg_no=XVI-3&chapter=16&clang=en
26. Inter-Parliamentary Union, WHO. *Child, Early and Forced Marriage Legislation in 37 Asia-Pacific Countries*. Geneva, Switzerland: WHO (2016).
27. Adhikari R. Demographic, socio-economic, and cultural factors affecting fertility differentials in Nepal. *BMC Pregnancy Childbirth* (2010) 10:19. doi:10.1186/1471-2393-10-19
28. Permanent Mission of Switzerland to the United Nations. *The PGA Handbook: A Practical Guide to the United Nations General Assembly*. New York, USA: Permanent Mission of Switzerland to the United Nations (2011).
29. Girls Not Brides. *Bangladesh Votes for Child Marriage Restraint Act 2016: Girls Not Brides Bangladesh Reacts* (2017). Available from: <http://www.girlsnotbrides.org/bangladesh-votes-child-marriage-restraint-act-girls-not-brides-bangladesh-reacts/>
30. Raj A, Boehmer U. Girl child marriage and its association with national rates of HIV, maternal health, and infant mortality across 97 countries. *Violence Women* (2013) 19(4):536–51. doi:10.1177/1077801213487747
31. Bongaarts J. The fertility-inhibiting effects of the intermediate fertility variables. *Stud Fam Plann* (1982) 13(6/7):179–89. doi:10.2307/1965445
32. Bongaarts J, Potter RE. *Fertility, Biology, and Behavior: An Analysis of the Proximate Determinants*. New York, USA: Academic Press (1983). 245 p.
33. Morgan SP, Rindfuss RR. Reexamining the link of early childbearing to marriage and to subsequent fertility. *Demography* (1999) 36(1):59–75. doi:10.2307/2648134
34. Kabir A, Jahan G, Jahan R. Female age at marriage as a determinant of fertility. *J Med Sci* (2001) 1:372–6. doi:10.3923/jms.2001.372.376
35. Nahar MZ, Zahangir MS, Islam SMS. Age at first marriage and its relation to fertility in Bangladesh. *Chin J Popul Resour Environ* (2013) 11(3):227–35. doi:10.1080/10042857.2013.835539
36. Coale AJ, Tye CY. The significance of age-patterns of fertility in high fertility populations. *Milbank Mem Fund Q* (1961) 39(4):631–46. doi:10.2307/3348701
37. Raj A, Saggurti N, Balaiah D, Silverman JG. Prevalence of child marriage and its effect on fertility and fertility-control outcomes of young women in India: a cross-sectional, observational study. *Lancet* (2009) 373(9678):1883–9. doi:10.1016/S0140-6736(09)60246-4
38. Nasrullah M, Muazzam S, Bhutta ZA, Raj A. Girl child marriage and its effect on fertility in Pakistan: findings from Pakistan Demographic and Health Survey, 2006–2007. *Matern Child Health J* (2014) 18(3):534–43. doi:10.1007/s10995-013-1269-y
39. Godha D, Hotchkiss D, Gage A. Association between child marriage and reproductive health outcomes and service utilization: a multi-country study from south Asia. *J Adolesc Health* (2013) 52(5):552–8. doi:10.1016/j.jadohealth.2013.01.021
40. Kamal SMM. Decline in child marriage and changes in its effect on reproductive outcomes in Bangladesh. *J Health Popul Nutr* (2012) 30(3):317–30. doi:10.3329/jhpn.v30i3.12296
41. Maitra P. Effect of socioeconomic characteristics on age at marriage and total fertility in Nepal. *J Health Popul Nutr* (2004) 22(1):84–96.
42. Nour NM. Child marriage: a silent health and human rights issue. *Rev Obstet Gynecol* (2009) 2(1):51–6.
43. Santhya KG, Ram U, Acharya R, Jejeebhoy SJ, Ram F, Singh A. Associations between early marriage and young women's marital and reproductive health outcomes: evidence from India. *Int Perspect Sex Reprod Health* (2010) 36(3):132–9. doi:10.1363/3613210
44. Ganchimeg T, Ota E, Morisaki N, Laopaiboon M, Lumbiganon P, Zhang J, et al. Pregnancy and childbirth outcomes among adolescent mothers: a World Health Organization multicountry study. *BJOG* (2014) 121:40–8. doi:10.1111/1471-0528.12630
45. Santhya J. Early marriage and sexual and reproductive health vulnerabilities of young women: a synthesis of recent evidence from developing countries. *Curr Opin Obstet Gynecol* (2011) 23(5):334–9. doi:10.1097/GCO.0b013e32834a93d2
46. Wall LL. Obstetric vesico vaginal fistula as an international public-health problem. *Lancet* (2006) 368(9542):1201–9. doi:10.1016/S0140-6736(06)69476-2
47. Ismail S. Re: prevalence of obstetric fistula: a population-based study in rural Pakistan. *BJOG* (2015) 122(4):587–587. doi:10.1111/1471-0528.13105
48. Goli S, Rammohan A, Singh D. The effect of early marriages and early child-bearing on women's nutritional status in India. *Matern Child Health J* (2015) 19(8):1864–80. doi:10.1007/s10995-015-1700-7
49. Spear BA. Adolescent growth and development. *J Acad Nutr Diet* (2002) 102(3):S23–9.

50. Wells JCK, DeSilva JM, Stock JT. The obstetric dilemma: an ancient game of Russian roulette, or a variable dilemma sensitive to ecology? *Am J Phys Anthropol* (2012) 149(S55):40–71. doi:10.1002/ajpa.22160
51. Dixon-Mueller R. How young is “Too Young”? Comparative perspectives on adolescent sexual, marital, and reproductive transitions. *Stud Fam Plann* (2008) 39(4):247–62. doi:10.1111/j.1728-4465.2008.00173.x
52. Rah JH, Christian P, Shamim AA, Arju UT, Labrique AB, Rashid M. Pregnancy and lactation hinder growth and nutritional status of adolescent girls in rural Bangladesh. *J Nutr* (2008) 138(8):1505–11.
53. UNFPA. *State of World Population 2005: The Promise of Equality*. New York, USA: United Nations Population Fund (2005).
54. Blanc AK. Excess risk of maternal mortality in adolescent mothers. *Lancet Glob Health* (2014) 2(4):e201. doi:10.1016/S2214-109X(14)70028-2
55. Nove A, Matthews Z, Neal S, Camacho AV. Maternal mortality in adolescents compared with women of other ages: evidence from 144 countries. *Lancet Glob Health* (2014) 2(3):e155–64. doi:10.1016/S2214-109X(13)70179-7
56. Conde-Agudelo A, Belizán JM, Lammers C. Maternal-perinatal morbidity and mortality associated with adolescent pregnancy in Latin America: cross-sectional study. *Am J Obstet Gynecol* (2005) 192(2):342–9. doi:10.1016/j.ajog.2004.10.593
57. Neal S, Mahendra S, Bose K, Camacho AV, Mathai M, Nove A, et al. The causes of maternal mortality in adolescents in low and middle income countries: a systematic review of the literature. *BMC Pregnancy Childbirth* (2016) 16:352. doi:10.1186/s12884-016-1120-8
58. Gibbs CM, Wendt A, Peters S, Hogue CJ. The impact of early age at first childbirth on maternal and infant health. *Paediatr Perinat Epidemiol* (2012) 26(Suppl 1):259–84. doi:10.1111/j.1365-3016.2012.01290.x
59. Vir SC. Improving women's nutrition imperative for rapid reduction of childhood stunting in South Asia: coupling of nutrition specific interventions with nutrition sensitive measures essential. *Matern Child Nutr* (2016) 12:72–90. doi:10.1111/mcn.12255
60. Subramanian S, Özaltın E, Finlay J. Height of nations: a socioeconomic analysis of cohort differences and patterns among women in 54 low- to middle-income countries. *PLoS One* (2011) 6(4):e18962. doi:10.1371/journal.pone.0018962
61. Fall C, Sachdev H, Osmond C, Restrepo-Mendez M, Victora C, Martorell R, et al. Association between maternal age at childbirth and child and adult outcomes in the offspring: a prospective study in five low-income and middle-income countries (COHORTS collaboration). *Lancet Glob Health* (2015) 3:e366–77. doi:10.1016/S2214-109X(15)00038-8
62. Motil KJ, Kertz B, Thotathuchery M. Lactational performance of adolescent mothers shows preliminary differences from that of adult women. *J Adolesc Health* (1997) 20(6):442–9. doi:10.1016/S1054-139X(97)00036-0
63. Lenders C, Tf M, To S. Nutrition in adolescent pregnancy. *Curr Opin Pediatr* (2000) 12(3):291–6. doi:10.1097/00008480-200006000-00021
64. Corsi DJ, Mejía-Guevara I, Subramanian SV. Risk factors for chronic undernutrition among children in India: estimating relative importance, population attributable risk and fractions. *Soc Sci Med* (2016) 157:165–85. doi:10.1016/j.socscimed.2015.11.014
65. Black MM, Walker SP, Fernald LCH, Andersen CT, DiGirolamo AM, Lu C, et al. Early childhood development coming of age: science through the life course. *Lancet* (2016) 389(10064):77–90. doi:10.1016/S0140-6736(16)31389-7
66. Hobcraft J. Fertility patterns and child survival: a comparative analysis. *Popul Bull UN* (1992) 33:1–31.
67. Hobcraft JN, McDonald JW, Rutstein SO. Demographic determinants of infant and early child mortality: a comparative analysis. *Popul Stud* (1985) 39(3):363–85. doi:10.1080/0032472031000141576
68. Finlay JE, Özaltın E, Canning D. The association of maternal age with infant mortality, child anthropometric failure, diarrhoea and anaemia for first births: evidence from 55 low- and middle-income countries. *BMJ Open* (2011) 1(2):e000226. doi:10.1136/bmjopen-2011-000226
69. Raj A, McDougal L, Silverman J, Rusch M. Cross-sectional time series analysis of associations between education and girl child marriage in Bangladesh, India, Nepal and Pakistan, 1991–2011. *PLoS ONE* (2014) 9(9):e106210. doi:10.1371/journal.pone.0106210
70. Chen X-K, Wen SW, Fleming N, Yang Q, Walker MC. Increased risks of neonatal and postneonatal mortality associated with teenage pregnancy had different explanations. *J Clin Epidemiol* (2008) 61(7):688–94. doi:10.1016/j.jclinepi.2007.08.009
71. Sinha S, Aggarwal AR, Osmond C, Fall CHD, Bhargava SK, Sachdev HS. Maternal age at childbirth and perinatal and under-five mortality in a prospective birth cohort from Delhi. *Indian Pediatr* (2016) 53(10):871–7. doi:10.1007/s13312-016-0950-9
72. Raj A, Saggurti N, Winter M, Labonte A, Decker M, Balaiah D, et al. The effect of maternal child marriage on morbidity and mortality of children under 5 in India: cross sectional study of a nationally representative sample. *BMJ* (2010) 340:b4258. doi:10.1136/bmj.b4258
73. UNICEF Innocenti Research Centre. *Early Marriage: Child Spouses*. Florence, Italy: UNICEF Innocenti Research Centre (2001). Report No.: 7.
74. Kneller G. *Educational Anthropology: An Introduction*. London, UK: John Wiley & Sons (1965).
75. Mathur S, Greene M, Malhotra A. *Too Young to Wed: The Lives, Rights, and Health of Young Married Girls*. Washington, DC, USA: ICRW (2003).
76. Raj A, Ghule M, Nair S, Saggurti N, Balaiah D, Silverman J. Age at menarche, education, and child marriage among young wives in rural Maharashtra, India. *Int J Gynaecol Obstet* (2015) 131(1):103–4. doi:10.1016/j.ijgo.2015.04.044
77. Field E, Ambrus A. Early marriage, age of menarche, and female schooling attainment in Bangladesh. *J Polit Econ* (2008) 116(5):881–930. doi:10.1086/593333
78. IIPS. *Nutrition in India: National Family Health Survey (NFHS-3) 2005-6*. Mumbai, India: IIPS and Ministry of Health and Family Welfare, Government of India (2009).
79. Wells J. Maternal capital and the metabolic ghetto: an evolutionary perspective on the transgenerational basis of health inequalities. *Am J Hum Biol* (2010) 22(1):1–17. doi:10.1002/ajhb.20994
80. Wells J. Adaptive variability in the duration of critical windows of plasticity. Implications for the programming of obesity. *Evol Med Public Health* (2014) 2014(1):109–21. doi:10.1093/emph/eou019
81. Bates L, Maselko J, Schuler S. Women's education and the timing of marriage and childbearing in the next generation: evidence from rural Bangladesh. *Stud Fam Plann* (2007) 38(2):101–12. doi:10.1111/j.1728-4465.2007.00121.x
82. Malhotra A, Pande R, Grown C. *Impact of Investments in Female Education on Gender Equality*. Washington, DC, USA: International Center for Research on Women (2003).
83. Choe M, Thapa S, Mishra V. Early marriage and early motherhood in Nepal. *J Biosoc Sci* (2005) 37(2):143–62. doi:10.1017/S0021932003006527
84. Gangadharan L, Maitra P. *The Effect of Education on the Timing of Marriage and First Birth in Pakistan*. Clayton, Australia: Monash University (2001) (Department of Economics: Report No.: 03/00, ISSN 1441-5429).
85. Black R, Victora C, Walker S, Bhutta Z, Christian P, de Onis M, et al. Maternal and child undernutrition and overweight in low-income and middle-income countries. *Lancet* (2013) 382(9890):427–51. doi:10.1016/S0140-6736(13)60937-X
86. Caldwell J, McDonald P. Influence of maternal education on infant and child mortality: levels and causes. *Health Policy Educ* (1982) 2(3–4):251–67. doi:10.1016/0165-2281(82)90012-1
87. Jejeebhoy SJ. *Women's Education, Autonomy, and Reproductive Behaviour: Experience from Developing Countries*. Oxford, UK: Clarendon Press (1995).
88. Marphatia A, Moussié R. A question of gender justice: exploring the influence of unpaid care work on girls' educational success. *Int J Educ Dev* (2013) 33(6):585–94. doi:10.1016/j.ijedudev.2013.05.005
89. Prost A, Colbourn T, Seward N, Azad K, Coomarasamy A, Copas A, et al. Women's groups practising participatory learning and action to improve maternal and newborn health in low-resource settings: a systematic review and meta-analysis. *Lancet* (2013) 381(9879):1736–46. doi:10.1016/S0140-6736(13)60685-6
90. Asadullah MN, Alim A, Khatoun F, Chaudhury N. *Maternal Early Marriage and Cognitive Skills Development: An Intergenerational Analysis*. Helsinki, Finland: The World Bank (2016).
91. Lee-Rife SM. Women's empowerment and reproductive experiences over the lifecourse. *Soc Sci Med* (2010) 71(3):634–42. doi:10.1016/j.socscimed.2010.04.019
92. Jensen R, Thornton R. Early female marriage in the developing world. *Gen Dev* (2003) 11(2):9–19. doi:10.1080/741954311
93. Das Gupta M. Life course perspectives on women's autonomy and health outcomes. *Am Anthropol* (1995) 97(3):481–91. doi:10.1525/aa.1995.97.3.02a00070

94. Upadhyay UD, Gipson JD, Withers M, Lewis S, Ciaraldi EJ, Fraser A, et al. Women's empowerment and fertility: a review of the literature. *Soc Sci Med* (2014) 115:111–20. doi:10.1016/j.socscimed.2014.06.014
95. Kidman R. Child marriage and intimate partner violence: a comparative study of 34 countries. *Int J Epidemiol* (2016) 46(2):662–75. doi:10.1093/ije/dyw225
96. Singh K, Verma P, Singh A. Female age at marriage and associated factors in EAG States of India. *J Adv Res Appl Math Stat* (2016) 1(2):53–9.
97. Prince M, Patel V, Saxena S, Maj M, Maselko J, Phillips MR, et al. No health without mental health. *Lancet* (2007) 370(9590):859–77. doi:10.1016/S0140-6736(07)61238-0
98. Kessler RC, Berglund P, Demler O, Jin R, Merikangas KR, Walters EE. Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the national comorbidity survey replication. *Arch Gen Psychiatry* (2005) 62(6):593–602. doi:10.1001/archpsyc.62.6.617
99. Patton GC, Viner R. Pubertal transitions in health. *Lancet* (2007) 369(9567):1130–9. doi:10.1016/S0140-6736(07)60366-3
100. Latthe P, Mignini L, Gray R, Hills R, Khan K. Factors predisposing women to chronic pelvic pain: systematic review. *BMJ* (2006) 332(7544):749–55. doi:10.1136/bmj.38748.697465.55
101. Niaz U. Women's mental health in Pakistan. *World Psychiatry* (2004) 3(1):60–2.
102. Patel V, Kirkwood BR, Pednekar S, Pereira B, Barros P, Fernandes J, et al. Gender disadvantage and reproductive health risk factors for common mental disorders in women: a community survey in India. *Arch Gen Psychiatry* (2006) 63(4):404–13. doi:10.1001/archpsyc.63.4.404
103. Chorghade G, Barker M, Kanade S, Fall C. Why are rural Indian women so thin? Findings from a village in Maharashtra. *Pub Health Nutr* (2006) 9(01):9–18. doi:10.1079/PHN2005762
104. Suhrabi Z, Delpisheh A, Taghinejad H. Tragedy of women's self-immolation in Iran and developing communities: a review. *Int J Burns Trauma* (2012) 2(2):93–104.
105. Malhotra A. *Remobilizing the Gender and Fertility Connection: The Case for Examining the Impact of Fertility Control and Fertility Declines on Gender Equality*. Washington, DC, USA: ICRW (2012). Report No.: 001–2012–ICRW–FE.
106. Smith L, Ramakrishnan U, Ndiaye A, Haddad L, Martorell R. *The Importance of Women's Status for Child Nutrition in Developing Countries*. Washington, DC, USA: IFPRI (2003). Report No.: 131.
107. UNDP. *Gender Inequality Index 2015* (2015). Available from: <http://hdr.undp.org/en/composite/GII>
108. Brinda E, Rajkumar A, Enemark U. Association between gender inequality index and child mortality rates: a cross-national study of 138 countries. *BMC Public Health* (2015) 15(1):1–6. doi:10.1186/s12889-015-1449-3
109. Marphatia A, Cole T, Grijalva-Eternod C, Wells J. Associations of gender inequality with child malnutrition and mortality across 96 countries. *Glob Health Epidemiol Genom* (2016) 1:e6. doi:10.1017/gheg.2016.1
110. UNICEF. *Childinfo Low Birthweight Statistics* (2013). Available from: <https://data.unicef.org/topic/nutrition/low-birthweight/>
111. UNICEF, WHO, World Bank Group. *Child Malnutrition Estimates* (2015). Available from: <http://data.unicef.org/countries/IND.html>
112. Bicchieri C, Jiang T, Lindemans J. *A Social Norms Perspective on Child Marriage: The General Framework*. Draft report for UNICEF. Philadelphia: Behavioral Ethics Lab, University of Pennsylvania (2014).
113. Mauss M. A category of the human mind; the notion of person; the notion of self. In: Carrithers M, Collins S, Lukes S, editors. *The Category of the Person*. Cambridge, UK: Cambridge University Press (1985). p. 1–25.
114. Vaitla B, Taylor A, Van Horn J, Cislak B. *Social Norms and Girls' Well-Being: Linking Theory and Practice*. Washington, DC, USA: Data2X (2017).
115. Anandalakshmy S. *The Girl Child and the Family: An Action Research Study*. New Delhi, India: Department of Women and Child Development, Ministry of Human Resource Development, Government of India (1994). 312 p.
116. Barrett J. A thesis on agency. In: Dobres M, Robb J, editors. *Agency in Archaeology*. London, UK: Routledge (2000). p. 61–8.
117. Balestrino A, Ciardi C. Social norms, cognitive dissonance and the timing of marriage. *J Socio Econ* (2008) 37(6):2399–410. doi:10.1016/j.socce.2008.05.002
118. Maertens A. Social norms and aspirations: age of marriage and education in rural India. *World Dev* (2013) 47:1–15. doi:10.1016/j.worlddev.2013.01.027
119. Khanna T, Verma R, Weiss E. *Child Marriage in South Asia: Realities, Responses and the Way Forward*. Bangkok, Thailand: ICRW (2013).
120. Dobres M, Robb J. Agency in archaeology paradigm or platitude? In: Dobres M, Robb J, editors. *Agency in Archaeology*. London, UK: Routledge (2000). p. 3–18.
121. Del Franco N. Aspirations and self-hood: exploring the meaning of higher secondary education for girl college students in rural Bangladesh. *Comp J Comp Int Educ* (2010) 40(2):147–65. doi:10.1080/03057920903546005
122. Klugman J, Hanmer L, Twigg S, Hasan T, McCleary-Sills J, Santa Maria J. *Voice & Agency: Empowering Women and Girls for Shared Prosperity*. Washington, DC, USA: World Bank (2014).
123. McCleary-Sills J, Hanmer L, Parsons J, Klugman J. Child marriage: a critical barrier to girls' schooling and gender equality in education. *Rev Faith Int Aff* (2015) 13(3):69–80. doi:10.1080/15570274.2015.1075755
124. Douglas M. *Purity and Danger: An Analysis of Concepts of Pollution and Taboo*. 2. London, UK: Routledge (1966). 202 p.
125. Anderson S. The economics of dowry and brideprice. *J Econ Perspect* (2007) 21(4):151–74. doi:10.1257/jep.21.4.151
126. Rukmini S. *Many Women Have No Say in Marriage. Disease and Dowry: Community Context, Gender, and Adult Health in India* (2016). Available from: <http://www.thehindu.com/news/national/many-women-have-no-say-in-marriage/article5801893.ece>
127. Delprato M, Akyeampong K, Sabates R, Hernandez-Fernandez J. On the impact of early marriage on schooling outcomes in Sub-Saharan Africa and South West Asia. *Int J Educ Dev* (2015) 44:42–55. doi:10.1016/j.ijedudev.2015.06.001
128. IIPS. *National Family Health Survey-4: 2015-16*. New Delhi, India: Ministry of Health and Family Welfare, Government of India (2016) (State Fact Sheet).
129. Raj A. When the mother is a child: the impact of child marriage on the health and human rights of girls. *Arch Dis Child* (2009) 95(11):931–5. doi:10.1136/adc.2009.178707
130. UNESCO. *Gender Review of the Global Education Monitoring Report 2016: Creating Sustainable Futures for All*. Paris, France: UNESCO (2016).
131. Kamal SMM, Hassan CH, Alam GM, Ying Y. Child marriage in Bangladesh: trends and determinants. *J Biosoc Sci* (2015) 47(1):120–39. doi:10.1017/S0021932013000746
132. UIS. *International Standard Classification of Education. ISCED 2011*. Quebec, Canada: UIS (2012).
133. UNESCO Institute of Statistics. *UNESCO UIS Education Country Databases* (2017). Available from: <http://www.uis.unesco.org>
134. Melchiorre A, Atkins E. *At What Age? Are School-Children Employed, Married and Taken to Court? Trends Over Time*. London, UK: Right-to-Education Project (2011).
135. ICRW. *Asia Child Marriage Initiative: Summary of Research in Bangladesh, India and Nepal*. Washington, DC, USA: ICRW (2013).
136. Aikman S, Rao N. Gender equality and girls' education: investigating frameworks, disjunctions and meanings of quality education. *Theory Res Educ* (2012) 10(3):211–28. doi:10.1177/1477878512459391
137. Jeffrey P, Jeffery R. Killing my heart's desire. In: Kumar N, editor. *Women as Subjects: South Asian Histories*. Charlottesville, USA: University of Virginia Press (1994). p. 125–71.
138. Kaber N. *Marriage, Motherhood and Masculinity in the Global Economy: Reconfigurations of Personal and Economic Life*. Brighton, UK: IDS (2007). Report No.: 290.
139. Jackson C. Introduction: marriage, gender relations and social change. *J Dev Stud* (2012) 48(1):1–9. doi:10.1080/00220388.2011.629653
140. Boyden J. 'We're not going to suffer like this in the mud': educational aspirations, social mobility and independent child migration among populations living in poverty. *Comp J Comp Int Educ* (2013) 43(5):580–600. doi:10.1080/03057925.2013.821317
141. Singh S, Samara R. Early marriage among women in developing countries. *Int Fam Plan Perspect* (1996) 22(4):148–75. doi:10.2307/2950812
142. Mitchell E. The new education plan in Nepal: balancing conflict in values for national survival. In: Calhoun C, Janni F, editors. *The Anthropological Study of Education*. The Hague, Netherlands: Mouton & Co (1976). p. 159–72.
143. World Bank. *Snakes and Ladders: Factors Influencing Successful Primary School Completion for Children in Poverty Contexts*. Washington, DC, USA: World Bank (2004) (Discussion paper series). Report No.: 6.

144. Amin S. *Empowering Adolescent Girls in Rural Bangladesh: Kishori Abhijan*. New York, USA: Population Council (2007).
145. Nanda P, Das P, Datta N, Lamba S. *Making Change with Cash? Evaluation of a Conditional Cash Transfer Program to Improve the Status of Girls in Northern India*. Washington, DC, USA: ICRW (2015).
146. Wodon Q. Early childhood development in the context of the family: the case of child marriage. *J Hum Dev Capab* (2016) 17(4):590–8. doi:10.1080/19452829.2016.1245277
147. Chodorow N. The psychodynamics of the family. In: Nicholson L, editor. *The Second Wave: A Reader in Feminist Theory*. New York, USA: Routledge (1997). p. 181–97.
148. Leonetti D, Nath DC, Hemam NS, Neill DB. Kinship organization and the impact of grandmothers on reproductive success among the matrilineal Khasi and patrilineal Bengali of Northeast India. In: Voland E, Chasiotis A, Schiefenhövel W, editors. *Grandmotherhood: The Evolutionary Significance of the Second Half of Female Life*. Piscataway, USA: Rutgers University Press (2005). p. 194–214.
149. Gero J. Troubled travels in agency and feminism. In: Dobres M, Robb J, editors. *Agency in Archaeology*. Washington, DC, USA: Routledge (2000). p. 34–9.
150. Malhotra A, Warner A, McGonagle A, Lee-Rife S. *Solutions to End Child Marriage: What the Evidence Shows*. Washington, DC, USA: ICRW (2011).
151. Osmani S, Sen A. The hidden penalties of gender inequality: fetal origins of ill-health. *Econ Hum Biol* (2003) 1(1):105–21. doi:10.1016/S1570-677X(02)00006-0
152. Arnot M, Schneider C, Welply O. Education, mobilities and migration: people, ideas and resources. *Comp J Comp Int Educ* (2013) 43(5):567–79. doi:10.1080/03057925.2013.822194
153. Lemmon GT, ElHarake LS. *High Stakes for Young Lives: Examining Strategies to Stop Child Marriage*. Washington, DC, USA: Council on Foreign Affairs (2014).
154. Desai S, Andrist L. Gender scripts and age at marriage in India. *Demography* (2010) 47(3):667–87. doi:10.1353/dem.0.0118
155. Wodon Q, Petroni S, Male C, Onagoruwa A, Savadogo A, Edmeades J, et al. *Economic Impacts of Child Marriage: Preliminary Findings from Analyses of Existing Data*. ICRW and the World Bank (2016).
156. Singh R, Vennam U. *Factors Shaping Trajectories to Child and Early Marriage: Evidence from Young Lives in India*. Oxford, UK: Young Lives (2016). Report No.: 149.
157. Svanemyr J, Chandra-Mouli V, Raj A, Travers E, Sundaram L. Research priorities on ending child marriage and supporting married girls. *Reprod Health* (2015) 12(80):1–4. doi:10.1186/s12978-015-0060-5
158. Massey DS. Segregation and stratification: a biosocial perspective. *Bois Rev Soc Sci Res Race* (2004) 1(1):7–25. doi:10.1017/S1742058X04040032
159. Barker DJP. The origins of the developmental origins theory. *J Intern Med* (2007) 261(5):412–7. doi:10.1111/j.1365-2796.2007.01809.x
160. Martorell R, Horta B, Adair L, Stein A, Richter L, Fall C, et al. Weight gain in the first two years of life is an important predictor of schooling outcomes in pooled analyses from five birth cohorts from low- and middle-income countries. *J Nutr* (2010) 140(2):348–54. doi:10.3945/jn.109.112300
161. Kim M, Longhofer W, Boyle EH, Nyseth Brehm H. When do laws matter? National minimum-age-of-marriage laws, child rights, and adolescent fertility, 1989–2007. *Law Soc Rev* (2013) 47(3):589–619. doi:10.1111/lasr.12033
162. Parsons J, Edmeades J, Kes A, Petroni S, Sexton M, Wodon Q. Economic impacts of child marriage: a review of the literature. *Rev Faith Int Aff* (2015) 13(3):12–22. doi:10.1080/15570274.2015.1075757
163. Kalamar AM, Lee-Rife S, Hindin MJ. Interventions to prevent child marriage among young people in low- and middle-income countries: a systematic review of the published and gray literature. *J Adolesc Health* (2016) 59(3 Suppl):S16–21. doi:10.1016/j.jadohealth.2016.06.015
164. Shroff M, Griffiths P, Adair L, Suchindran C, Bentley M. Maternal autonomy is inversely related to child stunting in Andhra Pradesh, India. *Matern Child Nutr* (2009) 5(1):64–74. doi:10.1111/j.1740-8709.2008.00161.x
165. Swidler A. Culture in action: symbols and strategies. *Am Sociol Rev* (1986) 51(2):273–86. doi:10.2307/2095521
166. Scolaro E, Blagojevic A, Filion B, Chandra-Mouli V, Say L, Svanemyr J, et al. Child marriage legislation in the Asia-Pacific region. *Rev Faith Int Aff* (2015) 13(3):23–31. doi:10.1080/15570274.2015.1075759
167. UNICEF. *Introduction to the Convention on the Rights of the Child: Definition and Key Terms*. New York, USA: UNICEF (2017).

Conflict of Interest Statement: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Copyright © 2017 Marphatia, Ambale and Reid. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) or licensor are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.