Marriage Age and Fertility Dynamics in India

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Abstract

It is widely acknowledged that age at marriage has a significant influence on fertility, particularly in countries where childbearing occurs within marriage. However, the complexities of this relationship are poorly understood, especially during fertility transitions. This paper investigates the complex relationship between marriage age and marital fertility by examining the initiation of childbearing and the transition to higher order births by marriage cohorts in India using data collected in a nationally representative survey in 2005-06. Results from the discrete-time logit models show that women marrying late have a shorter first birth interval than women marrying at a younger age. But second and higher birth intervals are longer among those marrying late compared with those marrying early. Given that women marrying at a younger age have shorter second and higher order birth intervals, efforts to promote late marriage could lead to a reduction in fertility and improve child and maternal health.

Introduction

The close association between fertility and prevailing nuptiality patterns is well acknowledged. The importance of marriage age on fertility variation is evident from its inclusion as one of the four proximate determinants of fertility (Bongaarts, 1982). In populations with higher age at marriage, fertility is generally observed to be low. This reduction in total fertility with increasing marriage age can occur under the following condition: if age-specific marital fertility rates do not differ by marriage age and if non-marital fertility is negligible. When marriage age increases under these conditions, fertility can decline because of the reduced number of women at risk of childbearing. In addition, marriage age can lower fertility when marital fertility among women marrying late is lower than among those marrying at a younger age.[1] In many societies, as Coale (1992) observed, the relationship between late marriage and low fertility is the result of higher control levels of marital fertility among the populations that marry late.

In this paper, the relationship between marriage age and fertility level is investigated using data from India. Particular emphasis is placed on the influence of marriage age on two interrelated components of the family-building process: the pace of childbearing and parity-specific fertility behavior.

Marriage rates in India have been remarkably stable for more than a century, with universal marriage being the norm. As per the 2001 census, the percent of never-married adults

[1]Marital fertility levels need not necessarily be lower among those marrying late compared with those marrying early. In some contexts, marital fertility may be higher for women marrying later than those marrying at an earlier age.

by the age of 40 was only about 3 percent for men and 1 percent for women (Registrar General, India, 2001). However, the marriage age has undergone a gradual but steady increase: singulate mean age at marriage increased from 16.8 to 20.2 years for women between 1961 and 2001 (Registrar General, India, 2001.). The increase in marriage age has not been widespread or dramatic: early marriage continues to be prevalent in some areas. For instance, in about one-third of marriages that occurred between 1998 and 2001, the age of the bride was 17 or lower (calculated from the 2001 Indian census data, Registrar General, India, 2001).

In comparison with marriage rates, fertility rates in India could be considered to have declined at a faster rate—the total fertility rate (TFR) declined from 3.39 in 1990-92 to 2.66 in 2003-05. The decline has been geographically uneven, however. In the southern states, the TFR ranged from 1.79 to 2.13 in 2003-05; however, in many of the northern states, the TFR was well above 3.0 in 2003-05. During this period, although knowledge about contraceptives was nearly universal, actual contraceptive use was about 56 percent. Female sterilization was the predominant contraceptive method, with 37 percent of women using this method (International Institute for Population Sciences [IIPS] and Macro International, 2007).

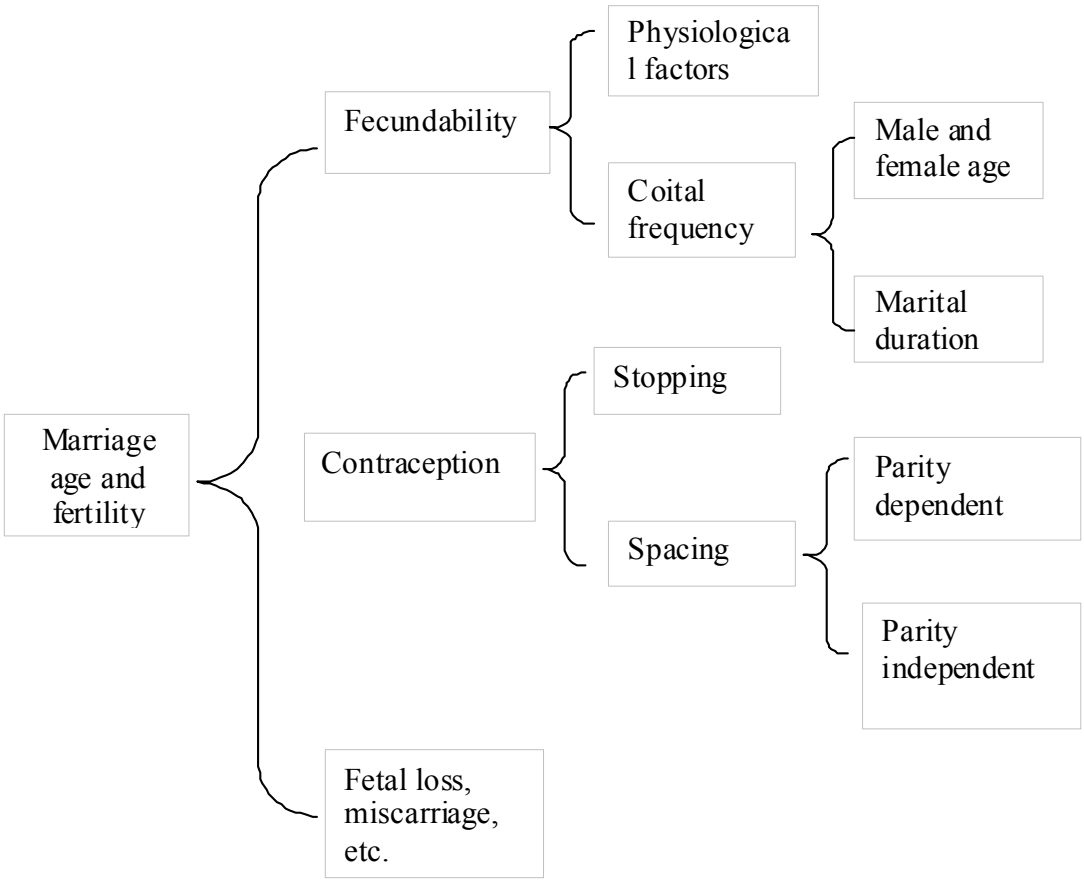
When trends in marriage age and fertility levels are compared, it appears that states with a higher marriage age also have a lower fertility rate, although this relationship is not universal. For instance, in Andhra Pradesh, the marriage age is comparatively low but fertility has declined rapidly. It is important to note that the factors that promote late marriage are also the ones that encourage smaller families. In the case of southern India, endogamy and kinship structures that provide greater autonomy to women have been put forth as factors responsible for both late marriage and low fertility rates there, whereas in northern India, exogamy and patriarchy have contributed to early marriage and high fertility levels (Dyson and More, 1983).

Marriage age and family-building processes

The introductory section describes how, in many settings, fertility could be influenced by existing marriage regimes, but little is said about the nature and magnitude of the influence. These are dealt with in this section. Explaining the nature of this relationship is especially difficult because of its complex nature, which is influenced by bio-demographical, family organization, and cultural factors. An attempt is made to disentangle these complexities using cross-national evidence.

The influence of marriage age on family-building processes could be studied under two headings: initiation of childbearing (first birth) and transition from one birth to the next. Each of these in turn can be examined using the framework presented in Figure 1. This figure is a simplified representation of the factors involved in the relationship between marriage age and fertility level and serves as a guide in structuring the literature review and analyses. Among the factors mentioned in Figure 1, limited attention is given to fetal loss and miscarriage (given the difficulty of connecting these losses with marriage age and the limited literature in this area), and discussion of the physiological elements of fecundability is circumscribed. Given that contraceptive use in most countries is limited before first birth, contraceptive use is treated in less detail for first births.

Figure 1: Pathways linking marriage age and fertility



Marriage age and childbearing

The first factor to be considered is fecundability—defined as "the probability that a woman in a susceptible state will conceive during a month of unprotected intercourse" (Weinstein et al., 1990:447). The variations in fecundability by marriage age of women, and broadly by female age, are well documented (Kallan and Udry, 1986). These variations could be attributed to physiological and behavioral factors (primarily related to changes in coital

frequency by age).

First, the physiological factors are discussed. It has been observed that fecundability increases from age of menarche (around age 13) until it reaches a peak at around age 25; from this age onward, fecundability declines until menopause (around age 45), when it ceases (Wood, 1994: chapter 7). From the biological perspective, the following proposition could be derived about marriage age and first birth interval: Proposition 1 is that women marrying at a younger age may have a longer first birth interval than those marrying later because of sub-fecundity; and (those marrying after age 25 could be expected to have a longer first birth interval because fecundability begins to decline after this age.

The second element of fecundability, in addition to the biological component, that influences fertility is coital frequency. This, unlike biology, shows great variation across societies, and its relationship to marriage age is quite complex. Coital frequency represents both the social and cultural constraints and notions about sex and the opportunity to have sexual intercourse. There are two marital factors that affect coital frequency: male and female age at marriage and marital duration (there are other nonmarital factors, such as migration, that could also influence coital frequency). Male and female age at marriage is considered next.

Early marriage has been observed to both delay consummation of marriage and lead to lower coital frequency. The delay in consummation of marriage is more common in societies in which marriage occurs before or immediately after menarche. In such settings, the actual consummation of marriage may be delayed until the girls reach physical and emotional maturity. Such delayed consummation of marriage, as seen in Nepal, can ultimately lead to limited differences in actual fertility levels among those marrying at a younger age and those marrying at an older age (Choe et al., 2005). In addition to the influence on consummation,

marriage age could influence coital frequency. The reason for lower coital frequency among the early-married stems from the fact that such marriages are usually arranged marriages in which the spouses have had no prior intimate relationship. Living arrangements after an arranged marriage, usually in an extended household, are detrimental to conjugal intimacy (Fricke and Teachman, 1993).

But this relationship is not universal. In settings in which early marriage is not associated with arranged marriage and extended household living arrangements, marriage age does not necessarily increase the first birth interval. It may, in some situations, reduce the first birth interval, as seen in China. Feng and Quanhe (1996) report that in China, first birth intervals declined along with the declines in marriage age during the 1980s. This shortening of birth intervals, as Hong (2006) argues, points to increased coital frequency among women marrying early. This increased coital frequency could be attributed to shifts in marriage systems from arranged marriage to free-choice marriage. It is argued that free-choice marriages promote greater emotional and physical bonds between the couples and, hence, increase coital frequency (Feng and Quanhe, 1996). Even with the limited discussion above, it is clear that the relationship between marriage age and fertility through fecundability is contingent on other social factors.

Some further propositions follow from the above discussion and could be added to the one already offered in this section. Proposition 2 is that women marrying early may have a longer first birth interval in settings in which marriage and family systems discourage individuality in spousal choice and living arrangements. In settings in which marriage age is not associated with such marriage and family systems, marriage age does not necessarily increase the first birth interval. Proposition 3 concerns women marrying late: in settings of high

fertility, those marrying late may have a shorter birth interval to make up for lost reproductive time (as documented in Egypt and Morocco by Eltigani, 2000).

Specific objectives

The objectives of this analysis are:

1) To examine the influence of a woman's marriage age on the family-building process. A key feature of this investigation is to go beyond studying the influence of marriage age on total fertility level by considering the impact of marriage age on the pace of childbearing and the influence of marriage age on parity-specific fertility behavior. These analyses provide an in-depth look at the patterns of childbearing initiation, progression of births, and birth interval dynamics by marriage age cohorts.

2) To investigate whether the influence of a woman's marriage age on the family-building process varies by region. The research pays close attention to whether the effects of marriage age are different for women living in different regions.

Data

Data from the National Family Health Survey conducted in 2005-06 (NFHS-3) are used for the analyses. A total of 124,385 Indian women age 15-49 were interviewed about a variety of issues related to fertility, reproductive health, and child health.

From the dataset, only currently married women who married in the 20 years preceding the survey (1987-2006) are included in the analysis. This restriction to women married in the last 20 years instead of the entire sample is designed to minimize selection bias. As Rindfuss et al. (1982) note, considering all women from cross-sectional data biases a sample "toward younger ages at initiation, toward the experience of older birth cohorts, and

towards the experience of most recent time periods." This bias can be illustrated within the context of the present analysis. Assuming that we are interested in birth intervals for women who married at age 25-29, it is highly likely that this marriage cohort will be drawn from the recent time period. Those who married at age 25-29 in an earlier year, such as 1970, would not be included in the sample because at the time of the interview, they would have been over the age of 49. Such biases can be minimized by selecting a subsample from the data; this is the reason for the 20-year limit in the present study.

Methods

Variable description

The main independent variable in the present analyses is marriage age. Marriage age could be considered as a continuous variable or as a series of categories. In this analysis, it is treated as a categorical variable with three levels: women who married when they were 16 or younger, those who married when they were age 17-19, and those who married at age 20 or above. Based on NFHS-3, the percentage of women in each of the above categories are as follows: 39 percent married at age 16 or younger, 36 percent married at 17-19, and 25 percent married at 20 or older. Of course, any categorization of a continuous variable is bound to be somewhat arbitrary.

Other variables used in the analysis are self-explanatory: age difference of the couple (age difference between the respondent and her current husband), education level, wealth index, current residence, religion, caste, period of marriage, and region (north, south, east, or west). In models for second and higher order birth intervals, the number of living sons at parity and marriage to previous birth interval are also included.

Descriptive methods

In the descriptive analysis, fertility behavior is narrowed down to the examination of parity-specific birth interval dynamics by marriage age. Here, the progression from marriage to first birth and from i^{th} birth to i+1 birth, with maximum i of 5, is examined. Survival curves offer an elegant way of visualizing the parity-specific birth interval dynamics. Such curves provide information about both the quantum and time trends of the transition to the next birth.

Multivariate methods

To analyze the influence of marriage age on time to first birth while adjusting for other covariates, multivariate survival methods are used. There are several such methods to choose from; the two prominent ones are the now-familiar and widely used Cox proportional hazard approach and the relatively new discrete-time person-period approach (henceforth referred to as discrete-time approach). For the present analyses, the discrete-time approach is used. This choice is motivated by the following reasons: (1) given that birth data are recorded in the Demographic and Health Surveys (DHS) surveys at the level of one month, a discrete unit, the discrete-time approach is more suitable than the Cox approach, which assumes that the time to event is continuous; (2) in the discrete-time approach, tied events are not a problem; and (3) unlike the Cox model, the discrete-time approach allows the estimation of the effect of time on the hazard of an event. The above discussion and what follows in the rest of this section is based primarily on Allison (1982, 1995), Retherford et al. (2006), and Schoumaker (2004).

The key element of the discrete-time approach is that each person contributes multiple observations based on the amount of time at risk. In the analysis of first birth, a woman is at risk of the event (i.e., a first birth) from the month of her marriage until the month of the birth of the first child. If no first birth has occurred by the time of the survey, the woman's data are

censored. In such a case, the risk extends from the month of marriage to the month of the survey. Each woman contributes one observation for each month in which she is at risk. Time is measured in months and is assumed to have a quadratic effect. A modification in calculating the risk period is necessitated by data issues. Those women who reported a negative first birth interval are treated as having a first birth interval of one month.

The other important component of the discrete-time approach is the specification of the functional form for the discrete hazard, also called the link function. For the present analysis, a logit function is used (the other alternative is a complementary log-log function). The choice of logit function is based on its popularity. In addition, because the estimates from this model have the same interpretation as estimates from the logistic models, they can be understood easily. The general statistical model can be expressed thus:

$$\text{logit}\,(p_{it}/1\text{-}p_{it}) = a_t + b_1X_{it} + \ldots\ldots + b_kX_{ik}$$

where p_{it} is the probability that the first birth occurs to an individual i at time t, given that she has not already had a first birth; a_t is the function of time t that is to be estimated;

$X_{it} \ldots X_{ik}$ is a set of covariates; and $b_1 \ldots b_K$ are vectors of the coefficients to be estimated.

The same procedure described above for the first birth interval is applied to subsequent birth intervals (i.e., from first to second birth and third to fourth birth). The only difference in these models is that time is measured in years.

Results

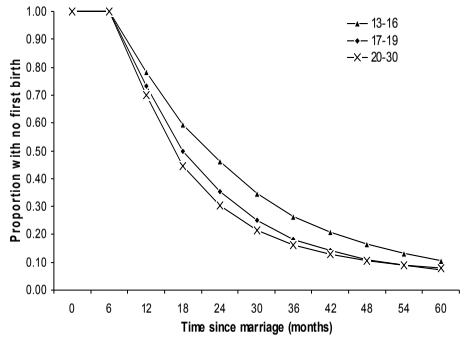
Descriptive results

Life table estimates of birth intervals for the three marriage cohorts are presented in

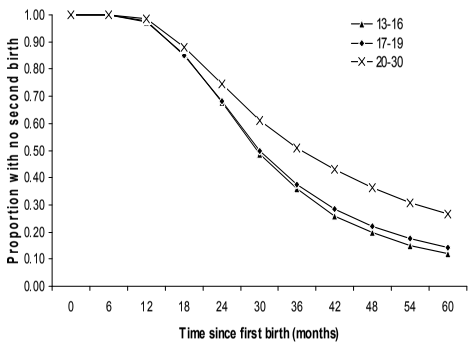
Figure 2. The results show that the first birth interval decreases with increasing marriage age, but second and higher order birth intervals increase with increasing marriage age. For the first birth, although 30 percent of women who married at age 20-30 have no first birth at the end of two years of marriage, 46 percent of those married at age 13-16 do not have a first birth by the end of the second year of marriage. However, by the end of five years, the percent remaining childless is about the same for all three marriage cohorts. For subsequent births, younger marriage cohorts have shorter birth intervals. For instance, at the end of five years after a second birth, 56 percent of those married between age 20 and 30 have no third birth compared with about 27 percent of those who married at age 13-16. As we move to the fifth and sixth births, the differences between marriage cohorts narrow, suggesting that marriage age does not necessarily influence fifth and sixth birth intervals. Overall, survival estimates show that although those marrying early delay entry into childbearing, after first birth they transition more rapidly to higher order births.

Figure 2: Survival estimates for birth intervals by marriage age cohort and parity, India 2005-06

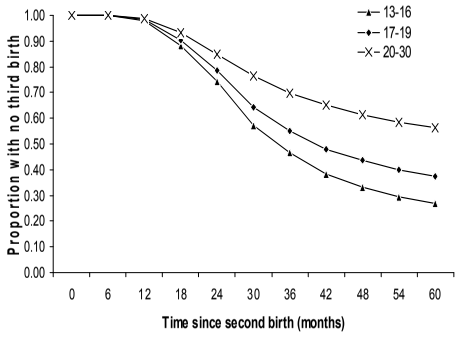
Panel A: Marriage to first birth



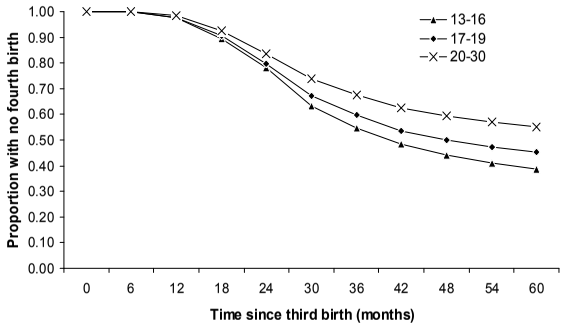
Panel B: First to second birth



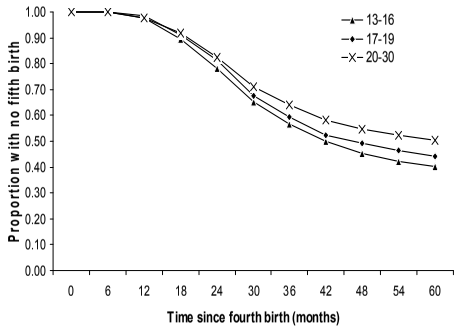
Panel C: Second to third birth



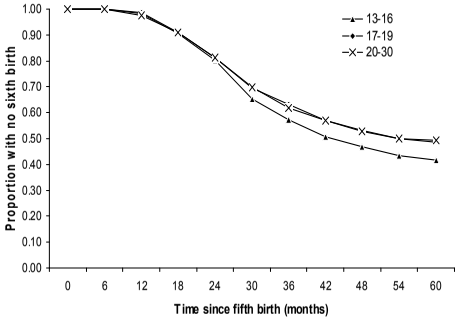
Panel D: Third to fourth birth



Panel E: Fourth to fifth birth



Panel F: Fifth to sixth birth



Descriptive statistics by marriage age cohort in Table 1 show that women who marry early are disadvantaged on several indicators. The younger marriage cohort is the least educated compared with the other groups. More than a quarter currently lives in the poorest wealth index households, and this cohort is overwhelmingly concentrated in rural areas. In terms of religious composition, those belonging to other (non-Hindu, non-Muslim) religious groups make up nearly 11 percent of those marrying at age 20-30. Similarly, a higher percentage of those married between 1987 and 1996 married at a younger age. Finally, spousal age difference declines as marriage age increases. Those marrying at age 20-30 years have a mean age difference of 4.6 years, compared with 5.8 years for those marrying at age 13-16 years**.**

Table 1: Descriptive statistics by marriage age cohort, India 2005-06 (percent, weighted)

	Marriage age (years)		
	13-16	**17-19**	**20-30**
Education			
No education	58.1	37.9	17.9
Primary	17.3	16.0	9.7
Secondary	24.2	42.9	47.9
Higher	0.4	3.2	24.5
Wealth Index			
Poorest	28.1	17.2	6.8
Poorer	26.3	18.8	9.5
Middle	22.0	20.6	14.7
Richer	15.9	23.9	23.7
Richest	7.6	19.5	45.2
Current residence			
Urban	20.0	31.2	49.7
Rural	80.0	68.9	50.3
Religion			
Hindu	82.1	80.7	79.2
Muslim	14.7	14.7	9.9
Other	3.2	4.6	10.9

(Cont'd)

Table 1 – Cont'd

	Marriage age (years)		
	13-16	**17-19**	**20-30**
Education			
No education	58.1	37.9	17.9
Primary	17.3	16.0	9.7
Secondary	24.2	42.9	47.9
Higher	0.4	3.2	24.5
Wealth Index			
Poorest	28.1	17.2	6.8
Poorer	26.3	18.8	9.5
Middle	22.0	20.6	14.7
Richer	15.9	23.9	23.7
Richest	7.6	19.5	45.2
Current residence			
Urban	20.0	31.2	49.7
Rural	80.0	68.9	50.3
Religion			
Hindu	82.1	80.7	79.2
Muslim	14.7	14.7	9.9
Other	3.2	4.6	10.9
Caste			
Scheduled caste	23.1	18.5	13.3
Scheduled tribe	10.5	8.3	5.7
Other backward class	43.5	41.3	36.2
Other	22.9	31.9	44.8
Period of marriage			
1987-1996	64.0	51.7	47.6
1997-2006	36.0	48.3	52.4
Spousal age difference, mean	5.8	5.2	4.6
N	25,965	23,048	15,930

Multivariate analysis of first birth interval

Table 2 presents the effects (odds ratios) of marriage age and other factors on the likelihood of transition from marriage to first birth. Model 1 presents the odds of a first birth for marriage age cohorts with no controls except time (duration since marriage). In this model, older marriage cohorts have higher odds of having a first birth (i.e., shorter birth intervals) than

younger marriage cohorts. For instance, women married between age 17 and 19 are 22 percent more likely to have a first child than those married at 13-16 years. A similar difference, 27 percent, can be seen between those married at age 20-30 years and age 13-16. This difference in the odds of a first birth persists in Model 2 in which socioeconomic controls are introduced. In Model 3, in which spousal age difference is also controlled for, the difference between the marriage cohorts persists and is of similar magnitude to that seen in Model 1. Overall, these three models are consistent with the survival estimates presented earlier. It is clear that those marrying at a younger age have a longer first birth interval, net of other factors.

Table 2: Transition from marriage to first birth, India 2005-06 (odds ratios)

	Model 1	Model 2	Model 3	Model 4
Marriage age (years)				
17-19	1.22 **	1.21 **	1.23 **	1.23 **
20-30	1.27 **	1.26 **	1.29 **	1.29 **
(13-16)	1	1	1	1
Spousal age difference			1.02 **	1.02 **
Region				
North				0.96 **
East				1.02
West				0.99
(South)				1
Education				
Primary		1.03 *	1.03 *	1.02 +
Secondary		1.05 **	1.03 **	1.03 *
Higher		0.94 **	0.94 **	0.94 **
(No education)		1	1	1
Wealth index				
Poorer		1.03 *	1.04 **	1.04 **
Middle		1.03 *	1.04 *	1.04 **
Richer		1.05 **	1.06 **	1.06 **
Richest		1.05 *	1.05 **	1.07 **
(Poorest)		1	1	1

(Cont'd)

Table 2 – Cont'd

	Model 1		Model 2		Model 3		Model 4	
Marriage age (years)								
17-19	1.22	**	1.21	**	1.23	**	1.23	**
20-30	1.27	**	1.26	**	1.29	**	1.29	**
(13-16)	1		1		1		1	
Spousal age difference					1.02	**	1.02	**
Region								
North							0.96	**
East							1.02	
West							0.99	
(South)							1	
Education								
Primary			1.03	*	1.03	*	1.02	+
Secondary			1.05	**	1.03	**	1.03	*
Higher			0.94	**	0.94	**	0.94	**
(No education)			1		1		1	
Wealth index								
Poorer			1.03	*	1.04	**	1.04	**
Middle			1.03	*	1.04	*	1.04	**
Richer			1.05	**	1.06	**	1.06	**
Richest			1.05	*	1.05	**	1.07	**
(Poorest)			1		1		1	
Current residence								
Urban			1.04	**	1.04	**	1.04	**
(Rural)			1		1		1	
Religion								
Hindu			0.85	**	0.86	**	0.86	**
Other			1.02		1.04		1.04	
(Muslim)			1		1		1	
Caste								
Scheduled tribe			0.98		0.98		0.97	
Other backward class			0.95	**	0.95	**	0.95	**
Other			0.97	*	0.97	**	0.96	**
(Scheduled caste)			1		1		1	
Period of marriage								
1997-2006			0.92	**	0.92	**	0.92	**
(1987-1996)			1		1		1	
Time (in months)	1.04	**	1.04	**	1.04	**	1.04	**
Time squared	1	**	1	**	1	**	1	**
N (person months)	1,605,587							

Significance level: ** p<0.01, *p<0.05, + p<0.1

( ) = reference category

Model 4 also controls for region. The introduction of this control has little influence on the transition to first birth by marriage cohort, which has a similar pattern to those of the first three models. There appear to be no differences in birth intervals among women living in the south, east, and west. However, women in the northern region are less likely to have a first birth than women in the southern region, net of other factors. To investigate whether the influence of marriage age varies by region, the interaction of marriage cohorts and region was analyzed. The results from the interaction were not significant (results not presented).

Multivariate analysis of higher order births

Table 3 presents adjusted odds of transition to next birth for women at parity one, two, and three (i.e., second, third, and fourth birth interval, respectively). In the first model, the odds of transition to second birth by marriage age cohort are presented net of region, education, wealth index, residence, religion, caste, period of marriage, spousal age difference, previous birth interval, number of sons, and time. In this model, in contrast to the first birth model, the older marriage cohorts have lower odds of a transition to the next birth (i.e., a longer second birth interval) than younger marriage cohorts. For instance, those married at age 20-30 years are 26 percent less likely to transition to the second birth than those who married at age 13-16 years. In contrast, those married at age 17-19 years are only approximately 3 percent less likely to have a second birth than those married at age 13-16 years.

Table 3: Transition to next birth, women at parity one and higher, India 2005-06 (odds ratios)

	Second birth		Third birth		Fourth birth	
Marriage age						
17-19	0.97	+	0.83	**	0.91	**
20-30	0.74	**	0.63	**	0.81	**
(13-16)	1		1		1	
Region						
North	1.29	**	2.42	**	2.64	**
East	0.86	**	1.77	**	2.07	**
West	1.18	**	2.01	**	1.64	**
(South)	1		1		1	
Education						
Primary	1.01		0.77	**	0.68	**
Secondary	0.88	**	0.59	**	0.59	**
Higher	0.56	**	0.33	**	0.33	**
(No education)	1		1		1	
Wealth index						
Poorer	0.97		0.97		0.9	**
Middle	0.95	*	0.92	**	0.8	**
Richer	0.97		0.8	**	0.67	**
Richest	0.75	**	0.55	**	0.44	**
(Poorest)	1		1		1	
Current residence						
Urban	0.9	**	1.02		1.04	
(Rural)	1		1		1	
Religion						
Hindu	0.81	**	0.64	**	0.58	**
Other	0.88	**	0.63	**	0.55	**
(Muslim)	1		1		1	
Caste						
Scheduled tribe	0.97		1.04		1.04	
Other backward class	1		0.96	+	1.02	
Other	0.87	**	0.74	**	0.81	**
(Scheduled caste)	1		1		1	
Period of marriage						
1997-2006	0.74	**	0.59	**	0.53	**
(1987-1996)	1		1		1	
Spousal age difference	0.98	**	0.98	**	0.99	**
Marriage to previous birth interval	0.89	**	0.86	**	0.87	**

(Cont'd)

Table 3 – Cont'd

	Second birth	Third birth	Fourth birth
Number of sons			
1	0.9 **	0.65 **	0.63 **
2		0.52 **	0.39 **
3			0.45 **
(0)	1	1	1
Time (in months)	5.38 **	5.45 **	6.04 **
Time square	0.84 **	0.81 **	0.78 **
N (person years)	176,681	175,759	99,135

Significance level: ** p<0.01, *p<0.05, + p<0.1
( ) = reference category

The third and fourth birth models reveal a pattern similar to the one for second birth interval, i.e., longer birth intervals (or lower odds of having a next birth) among older marriage cohorts. The odds of a transition to a third and fourth birth for women married at age 20-30 are 37 and 19 percent lower, respectively, than the odds for those married at age 13-16 years. Similarly, the odds of a transition to a third and fourth birth for women married at age 17-19 years are 17 and 9 percent lower, respectively, than for the youngest marriage cohort.

All three models indicate that a higher number of living sons at each parity reduces the odds of a next birth (i.e., lengthens the birth interval). For instance, having two sons at parity two decreases the odds of having a third birth by nearly half, and having two sons at parity three decreases the odds of a fourth birth by nearly three-fifths. Also, the effect of education is in the expected direction—with increasing education levels, the odds of a transition to a next birth decrease at all parities. But the influence of wealth is not consistent across all parities. Although the difference between the richest and poorest households is evident for all parities, differences among the other groups are only present at higher parities. Region also has a

significant influence on birth interval. Southern women have longer birth intervals than women in other regions, except for the second birth interval for which women in the eastern region have the longest birth interval.

Discussion

This paper investigated the relationship between marriage age, initiation of childbearing, and transitions to higher order births. As expected, marriage age had a significant influence on the first birth interval, with women marrying early delaying childbirth compared with those marrying late. This delay in entry into motherhood for those marrying early could be due to physiological factors (mainly sub-fecundity at younger ages), low levels of coital frequency, or a combination of both. In the present analyses, it is difficult to identify the precise pathways for the delay in childbearing among women marrying at a younger age. Nevertheless, it is clear that those marrying early delay entry into childbearing.

When it comes to high-order birth intervals, the pattern is reversed. For birth intervals higher than one, as marriage age increases, birth intervals also increase. In contrast with the first birth interval, the magnitude of the difference between marriage age cohorts is more pronounced between women married at age 13-16 and 20-30 years, whereas the difference between those married at age 13-16 and 17-19 years is relatively small. Also, birth intervals increase with increasing birth orders. This increase could point to stopping behavior at higher parities. Furthermore, birth intervals at higher parities are influenced significantly by the number of living sons, region of residence, wealth, and educational level.

One of the implications of these findings is the importance of focusing on the reproductive health needs of women who marry at a younger age. Although these women delay

the first birth, they have shorter intervals to subsequent births. In addition, women marrying early and having births at younger ages tend to have higher levels of child mortality and maternal mortality. The results also indicate the strong influence of son preference on birth intervals: women with no or fewer sons invariably have shorter birth intervals at all parities. Any decline in son preference has a substantial potential to lengthen birth intervals.

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