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Impact of the Sex of the First Child on Second Birth Interval in Uttar Pradesh: A Non-Parametric and Semi-Parametric Approach

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Abstract

The interval between a woman's first and second birth, known as second birth interval (SBI), is a crucial indicator of reproductive behaviour, with implications for maternal and child health and population policy. This paper has analysed SBI among ever-married women of reproductive age in Uttar Pradesh, India, using data from the fifth round of the National Family Health Survey (NFHS-5), 2019–21. Non-parametric Kaplan–Meier (KM) and semi-parametric Cox proportional hazard (CPH) survival analysis techniques have been employed to estimate SBI and identify its predictors. The tri-mean of SBI is estimated to be 34.25 months. The CPH model revealed that age at first birth, religion, education, caste, place of residence, wealth index, foetal loss/stillbirth, and sex of the first child have significant influence on the timing of the second birth. In particular, women whose first child is female have a 4.2 per cent higher likelihood of progressing to the second birth compared to those whose first child is male. The analysis underscores role of gender preference in shaping reproductive behaviour. The paper provides valuable insights for designing targeted reproductive health interventions and informing family planning policies.

Introduction

The timing between two successive births, known as the birth interval, and the time between the first and the second birth known as the second birth interval (SBI), play a vital role in shaping fertility trends, affecting both maternal and child health outcomes and informing population policies (Marini and Hodsdon, 1981; Conde-Agudelo et al, 2006; Afolabi and Palamuleni, 2022). SBI measures how first two births are spaced and reflects the underlying reproductive behaviour including how well family planning works in regulating fertility (Nath et al, 2000; Ahammed et al, 2019). The World Health Organization (WHO) has recommended a spacing of at least 24 months between two successive live births to reduce health risks and recommends a span of 3-5 years as ideal. Too short or too long birth interval can lead to increased chances of maternal health complications, low birth weight, premature deliveries, and even infant mortality (WHO, 2007).

In demographic research globally, much attention has been paid to patterns of SBI in Africa and parts of the Middle East (Moultrie et al, 2012; Fallahzadeh et al, 2013). However, the scenario in India, particularly in Uttar Pradesh, remains underexplored in this regard. Uttar Pradesh is the most populous state of India and fertility in the state is high relative to other states of the country and female marriage at an early age is quite common. According to the latest National Family Health Survey (NFHS-5), Uttar Pradesh continues to demonstrate wide variation in fertility and reproductive behaviour across socio-economic and regional lines, contributing significantly to national demographic scenario (Government of India, 2022).

Understanding the determinants of SBI in Uttar Pradesh is vital for two reasons. First, Uttar Pradesh is central to India's demographic transition, and its reproductive patterns significantly influence national fertility trends. Second, the state exhibits significant diversity in socio-demographic characteristics such as education, wealth, urban-rural divide, religion, and access to healthcare, all of which are known to influence fertility decisions and birth intervals (Singh et al, 1993; Nath et al, 2000; Halli et al, 2019; Singh and Rai, 2025). Educational attainment, in particular, has emerged as a powerful determinant of reproductive behaviour. Studies have consistently shown that higher levels of maternal education are associated with delayed childbearing, greater autonomy in fertility decisions, and better use of contraceptive methods (Ní Bhrolcháin and Beaujouan, 2012).

There is evidence to suggest that the practice of family planning for spacing births, particularly, spacing between the first and the second birth remains inconsistent across Uttar Pradesh (Santhya et al, 2007). While the desire for at least two children remains strong in many Indian communities, the timing of the second birth is increasingly seen as a strategic decision influenced by education, economic opportunities, and access to reproductive healthcare (Rajan et al, 2018; Halli et al, 2019). SBI, therefore, represents a vital mechanism through which policy efforts can promote replacement-level fertility and better maternal and child health outcomes. A particularly important factor influencing the timing of the second birth in India is the sex of the first child. Son preference has historically been strong in many parts of the country, including Uttar Pradesh, where cultural, social, and economic values attached to a son plays a decisive role in fertility decisions. Couples whose first child is a female are found to be often more likely to reduce the period between the first birth and the second birth or SBI in the hope that the second child would be male, couples whose first child in male may delay or space their second birth more strategically (Shukla et al, 2018). This gender-driven fertility behaviour is closely linked to patriarchal norms, inheritance practices, and expectations regarding old-age security, all of which reinforce the desire for sons.

Despite the significance of SBI, empirical studies using robust statistical frameworks like the non-parametric and semi-parametric model remain limited in Uttar Pradesh, and nearly absent for SBI. Survival analysis methods, particularly the CPH regression, allow for the estimation of time-to-event data while accommodating censored observations (Cox, 1972), an essential feature for analysing birth intervals where not all women may experience a second birth during the study period. Non-parametric and semi-parametric models have been effectively employed in various contexts to analyse inter-birth intervals and waiting time of conceptions (Nair, 1996; Nath et al, 2000; Mahmood et al, 2013; Singh et al, 2016), offering insights into the relative risks associated with different socio-demographic and behavioural covariates.

In the above context, the present study aims to analyse SBI among ever-married women of reproductive age in Uttar Pradesh using survival analysis techniques (non-parametric and semi-parametric). The study also examines the role of socio-demographic, economic, and behavioural factors influencing SBI.

Methods

Data Source. This study uses data from the National Family Health Survey (NFHS-5) for Uttar Pradesh, India. The survey provides detailed information on demographic and reproductive health characteristics of ever-married women of reproductive age (15–49 years). It was conducted the Government of India, Ministry of Health and Family Welfare and was coordinated by the International Institute for Population Sciences (IIPS), Mumbai. The survey employed a stratified two-stage sampling design that ensured representativeness at national, state/union territory, and district levels. In the first stage, primary sampling units (PSUs) were selected using the village and town list of the 2011 population census as sampling frame. In the rural areas, PSUs were villages, while in the urban areas they were census enumeration blocks (CEBs). In the second stage of sample selection, a systematic random sample of 22 households was drawn from each PSU based on the newly created household list. All ever-married women of reproductive age residing in these selected households were surveyed (Government of India, 2022).

Study Design and Setting. The present study is limited to only those ever-married women of reproductive age who had given at least one live birth at the time of the survey. Women who reported that their second birth occurred within 12 months of the first birth were excluded from the analysis to ensure biological plausibility and avoid postpartum bias as it is biologically uncommon to conceive and give birth within that period due to the typical 9 months gestation period and approximately 2–3 months of the duration of postpartum amenorrhea (PPA) (Bongaarts and Potter, 1983; Yadava et al, 2025). Additionally, to minimise the influence of extreme values and reduce potential censoring bias, we restricted the analysis to ever-married women whose second birth or censoring occur within 120 months (10 years) from the survey date. After applying these criteria and excluding women with missing or implausible dates and negative intervals, the final sample for the analysis consisted of 22616 ever-married women of reproductive age. For women who had a second birth (i.e., event), the SBI was calculated by subtracting the date of the first birth from the date of the second birth. Among these women, 8070 (35.72 per cent) women did not give birth to a second child by the survey date and, therefore, they were considered as censored.

Study Variables. SBI, defined as the duration (in months) between a woman's first and second live birth, is treated as the response variable in the present analysis. On the other hand, the explanatory variables included a range of socio-economic, demographic, and reproductive health variables. Several predictors have been identified in previous studies that influence birth interval (Nath et al, 2000; Singh et al, 2016; Seyedtabib et al, 2020; Afolabi & Palamuleni, 2022; Zambwe, 2023). We have considered age at first birth, religion, women education, place of residence, wealth index, social class, ever had terminated pregnancy due to foetal loss or still birth, sex of the first child, and mass media exposure as explanatory variables.

Statistical analysis. Survival analysis techniques have been employed to examine the timing of the second birth. For women who have experienced a second birth, the event time was defined as the SBI. Women who did not have the second birth by the time of the survey are treated as censored, with the censoring time defined as the time between the first birth and the date of the interview.

Let T be a continuous random variable representing the survival time (here, the time between the first and second birth), t be a specific time point, and $f(t)$ be the probability density function of T. Then the survival function $S(t)$ gives the probability that a woman does not have a second birth by time t and is defined as:

$$S(t) = P(T > t) = 1 - P(T \leq t) = 1 - F(t) \tag{1}$$

where $F(t)$, gives the probability of the second birth before time t, and is defined as:

$$F(t) = P(T < t) = \int_0^t f(v)dv\,; t \geq 0 \tag{2}$$

The hazard function $h(t) \geq 0$, represents the instantaneous risk of a second birth at time t, given that the woman does not have a second birth until that time and is given by

$$h(t) = \lim_{\Delta t \to 0} \frac{P(t<T<t+\Delta t|T>t)}{\Delta t} = \frac{f(t)}{1-F(t)} = \frac{f(t)}{S(t)} \tag{3}$$

In this study, both non-parametric and semi-parametric methods were employed to analyse the time between the first birth and the second birth (SBI). The Kaplan–Meier (KM) estimator, developed by Kaplan and Meier (1958), has been used to describe the survival function or the probability that a woman does not have a second birth by the given time. Let the sample consists of n independent observations denoted by (t_i, c_i), where t_i is the observed time and c_i is the censoring indicator and $m \leq n$ is the number of women who have second birth. Let $t_{(1)} \leq t_{(2)} \leq \cdots \leq t_{(m)}$ be the ordered event times, n_i be the number of women at risk just before $t_{(i)}$, and d_i the number of second births at time $t_{(i)}$. Then, the Kaplan–Meier estimate of the survival function is given as

$$\hat{S}(t) = \prod_{t_{(i)} \leq t} \left(\frac{n_i - d_i}{n_i}\right) \tag{4}$$

and $\hat{S}(t) = 1$ if $t < t_{(1)}$.

The log-rank test (Wellek, 1993) has been used to test the statistical significance of the difference in SBI across different categories of women by explanatory variables while the frequency distribution, tri-mean, and spread has been used as descriptive statistics to describe the variation. The tri-mean (*TM*) is a robust measure of central tendency compared to mean in case of non-normal data (Páez and Boisjoly, 2022) and can be calculated as

$$TM = \frac{Q_1+Q_3+2Q_2}{4} \quad (5)$$

The spread is measured in terms of semi-interquartile range (SIQR), which is a robust measure of spread (Wilcox, 2012) and is given by

$$SIQR = \frac{Q_3-Q_1}{2} \quad (6)$$

Finally, the Cox proportional hazard (CPH) model has been applied to assess the net effect of explanatory variables on the timing of the second birth. CPH is a semi-parametric regression technique (Cox, 1972) and is given by

$$h_i(t) = h_0(t)\exp(\beta_1 x_{1i} + \beta_2 x_{2i} + \cdots + \beta_p x_{pi}) \quad (7)$$

where $h_0(t)$ is the baseline hazard function; x_{ji} is a vector of covariates and β_j is a vector of parameters for fixed effects. Equation (7) can be written as

$$log\left(\frac{h_i(t)}{h_0(t)}\right) = \beta_1 x_{1i} + \beta_2 x_{2i} + \cdots + \beta_p x_{pi} \quad (8)$$

The sign of the regression coefficients in equation (8) indicates the direction of the effect of the covariate on the hazard ratio (HR). The HR, obtained by exponentiating the regression coefficient, reflects the relative risk of experiencing the event. HR>1 suggests a higher likelihood of the second birth occurring sooner (a shorter SBI), while HR<1 indicates higher likelihood of a longer SBI. HR=1 implies no effect of the covariate on the timing of the second birth. The statistical significance of these effects was evaluated at the 5 per cent level (p-value < 0.05).

Results

Table 1 presents summary measures of distribution and log-rank test for median SBI in Uttar Pradesh according to the explanatory variables included in the analysis. The tri-mean of SBI among ever married women is estimated to be 34.25 months. The spread shows considerable variation across population subgroups, reflecting differences in the interval between the first and the second birth (SBI). The table indicates that women who had first birth before 20 years of age had a shorter SBI with a tri-mean of 31.75 months and spread 11.5 months, compared to women who had first birth after 20 years of age (Tri-mean 35.25 months, spread 14.5 months) and the difference is statistically significant (p = 0.000). This indicates that age at first birth is associated with SBI. On the other hand, Hindu women had a longer SBI (tri-mean 34.25 months, spread 13.5 months) compared to Muslim women (tri-mean 31 months, spread = 12 months), and the difference is statistically significant (p = 0.000) which shows that religious affiliation has a bearing on SBI. Similarly, the level of education of the woman has a strong positive association with SBI – the higher the level of education of the woman the longer the SBI and vice versa. Women without any education had a shorter SBI (Tri-mean 30.75 months, spread 10.5 months) while women having higher education had the longest SBI (Tri-mean 45 months, spread 21 months. The upward gradient with education is found to be statistically significant (p = 0.000), highlighting education as a major determinant of SBI.

Table 1: Summary measures of log rank test for median of second birth interval of Uttar Pradesh according to socio-demography characteristics.

Characteristic	Number	Per cent	Tri-mean (months)	Spread	Log rank test for median (*p*-value)
Age at first birth					
≤20 years	5,880	26.00	31.75	11.5	0.000
>20 years	16,736	74.00	35.25	14.5	
Religion					
Hindu	19,181	84.81	34.25	13.5	0.000
Muslims	3,435	15.19	31.00	12.0	
Education					
No Education	4,946	21.87	30.75	10.5	0.000
Primary	2,758	12.19	30.25	10.5	
Secondary	10,216	45.17	33.00	13.0	
Higher	4,696	20.76	45.00	21.0	
Place of residence					
Urban	3,999	17.68	40.50	20.0	0.000
Rural	18,617	82.32	32.75	12.5	
Sex of first child					
Male	12,503	55.28	34.25	13.5	0.001
Female	10,113	44.72	34.00	13.0	
Wealth index					
Poorest	4,999	22.10	30.75	10.5	0.000
Poorer	5,833	25.79	32.00	12.0	
Middle	4,386	19.39	33.00	13.0	
Richer	3,793	16.77	36.00	15.0	
Richest	3,605	15.94	44.25	22.5	
Social Class					
SC/ST	6,016	26.60	32.00	12.0	0.000
OBC	12,368	54.69	34.00	13.0	
Others	4,232	18.71	38.00	18.0	
Ever had Foetal Loss/ Still Birth					
No	18,346	81.12	34.00	13.0	0.000
Yes	4,270	18.88	35.50	15.0	
Mass Media Exposure					
Not exposed	7,360	32.54	31.50	11.0	0.000
Exposed	15,256	67.46	34.25	14.5	
Total	22,616	100.00	34.25	13.5	

Remarks: SC: Scheduled Castes; ST: Scheduled Tribes; OBC: Other Backwards Classes.
Source: Authors

Place of residence also matters. Urban women have a longer SBI (tri-mean 40.5 months, spread 20 months), compared to rural women (tri-mean 32.75 months, spread 12.5 months) and the difference is statistically significant. The reason for this difference may be traced to better access to healthcare and family planning services in the urban areas. The sex of the first child also influences SBI. Women whose first child is male have a longer SBI (tri-mean 34.25 months, spread 13.5 months compared to women whose first child is female (tri-mean 34 months, spread 13 months). Although the tri-mean is nearly identical in the two groups of women, yet the log-rank test shows that the difference is statistically significant difference ($p = 0.001$) which means that the sex of the first child does have an impact on SBI.

Table 1 also shows that the SBI is also influenced by such covariates as the living standard of women as measured through the household wealth index, social class, and exposure to mass media. The history of foetal loss or stillbirth also has an impact of SBI as women having the history of foetal loss or still birth have a longer SBI (tri-mean 35.5 months, spread 15 months) compared to SBI in women who had no history of foetal loss and still birth (tri-mean 34 months, spread 13 months) and the difference is statistically significant ($p=0.000$) which suggests that adverse reproductive experience may have an impact on SBI. Figure 1 presents KM survival curves which show the probability that a woman does not have the second birth within the given time since the first birth, by various socio-demographic and reproductive characteristics of women. Each curves compares survival functions across different categories of women.

We have applied the Cox proportional hazard (CPH) model to identify the predictors of the time to second birth given that the woman already has a child and the results of the fitting of the model are presented in Table 2. The table suggests that the age at first birth, religion, level of education, place of residence, standard of living, social class, and the history of foetal loss or still birth are significant predictors of the time to second birth from the time of the first birth (SBI). A hazard ratio (HR)>1 indicates an increased probability of the second birth within a given time which implies a shorter SBI) while an HR <1 implies a reduced probability of the second birth within the given time period or delayed progression to the second birth, leading to a longer SBI. Two models are fitted. The first model excludes the sex of the first child as predictor while the second model includes the sex of the first child as predictor of SBI. A comparison of the two models highlights the impact of the sex of the first child on SBI.

Model 1 indicates that women whose age at first birth exceeds 20 years have around 8 per cent lower chance of progressing to a second birth compared to women whose age at first birth is less than or equal to 20 years. Similarly, Muslim women have 15 per cent chance of progressing to second birth compared to Hindu women. Women having primary education have around 4 per cent higher chance of progressing to second birth compared to women with no education but the difference is not statistically significant. On the other hand, women having secondary education have around 5 per cent lower chance of progressing to second birth compared to women with not education and the difference is statistically significant. By comparison, women having higher education have almost 30 per cent lower chance of progressing to the second birth relative to women with no education. Women living in the rural areas also have almost 16 per cent higher chance of progressing to the second birth within the given time period compared to the women living in the urban areas and this ratio is found to be statistically significant which indicates that the residence of woman is a strong predictor of SBI.

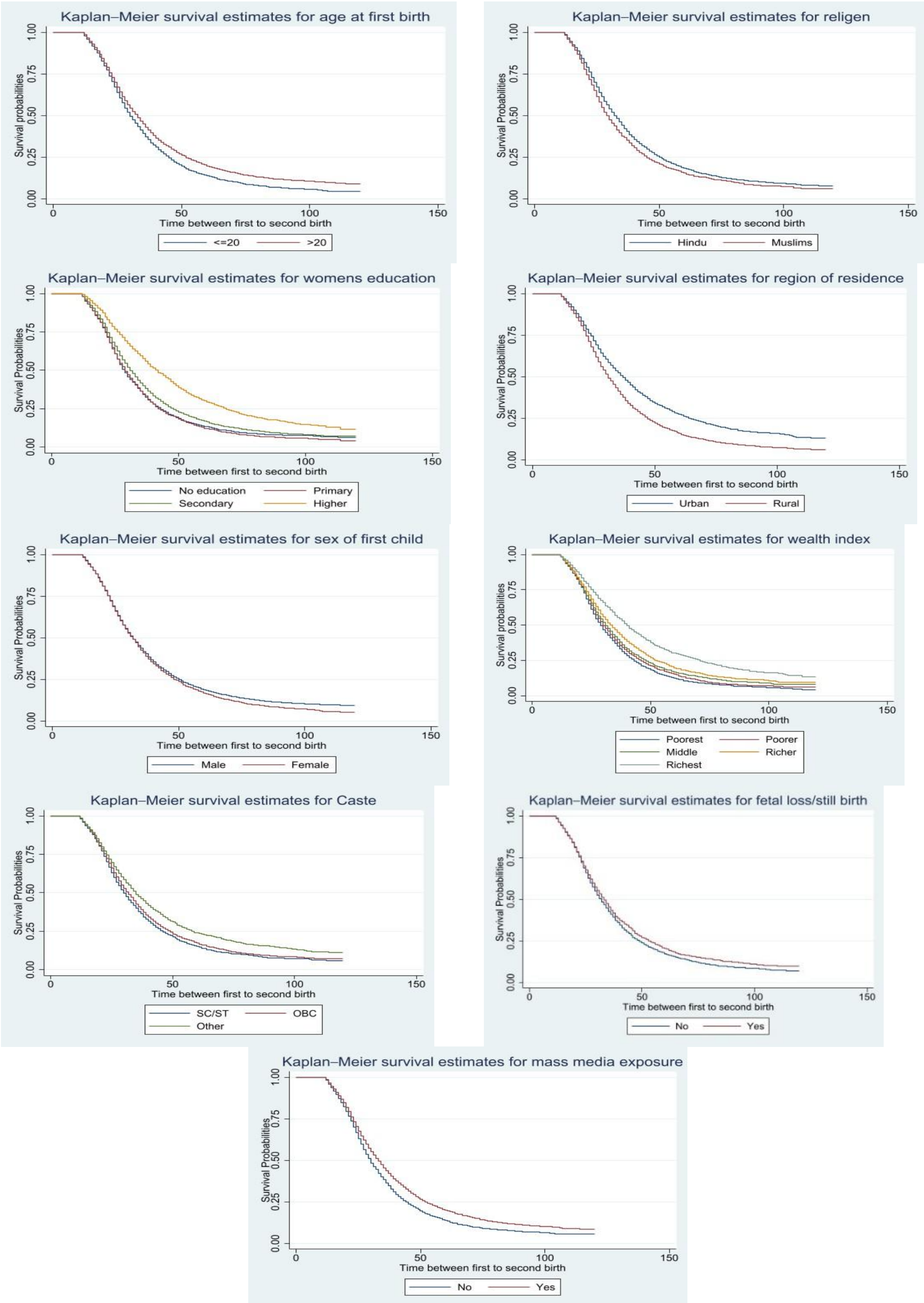

Figure 1: Kaplan-Meier curve of progression to second birth by time according to different characteristics of women.
Source: Authors.

Table 2: Results of fitting the Cox proportional hazard model.

Characteristics	Model 1			Model 2		
	HR	Z	*p*-value	HR	Z	*p*-value
Age at First Birth						
≤20 years$						
>20 years	0.922	-4.40	0.000	0.922	-4.41	0.000
Religion						
Hindu$						
Muslim	1.156	5.95	0.000	1.155	5.90	0.000
Education						
No Education$						
Primary	1.043	1.50	0.135	1.042	1.48	0.139
Secondary	0.951	-2.26	0.024	0.952	-2.22	0.026
Higher	0.707	-11.45	0.000	0.708	-11.41	0.000
Place of Residence						
Urban$						
Rural	1.158	5.66	0.000	1.158	5.67	0.000
Wealth Index						
Poorest$						
Poorer	0.968	-1.37	0.170	0.968	-1.34	0.179
Middle	0.959	-1.54	0.124	0.959	-1.53	0.125
Richer	0.919	-2.75	0.006	0.920	-2.72	0.007
Richest	0.799	-6.20	0.000	0.800	-6.17	0.000
Social Class						
SC/ST$						
OBC	0.958	-2.13	0.033	0.959	-2.11	0.035
Others	0.875	-4.93	0.000	0.876	-4.91	0.000
Ever had Foetal Loss/ Still Birth						
No$						
Yes	0.933	-3.35	0.001	0.932	-3.37	0.001
Mass Media Exposure						
Not exposed$						
Exposed	0.985	-0.78	0.437	0.984	-0.80	0.422
Sex of first child						
Male						
Female				1.042	2.47	0.014
-2log-Likelyhood	263118.94			263112.86		

$Reference category

Remarks: SC: Scheduled Castes; ST: Scheduled Tribes; OBC: Other Backwards Classes.

Source: Authors

The table also reveals a clear socioeconomic gradient in the progression to second birth. Compared to women having the poorest living standard, there is no statistically significant difference in time to second birth in women having poor and middle level of standard of living. However, the probability of progression to second birth is statistically significantly lower in women with richer and the richest standard of living. Women with the richest standard of living has more than 20 per cent lower probability of progressing to second birth compared to women having the poorest standard of living. Social class differences in the probability of progression to second birth with a given time are also apparent from the table.

The table also shows statistically significant impact of the history of foetal loss or still birth on the progression to second birth. It may, however, be recognised that the interval between two successive live births also includes the interval between the time of the first birth and the time of foetal loss or still birth. This means that the experience of foetal loss or still birth leads to the increase in the interval between two successive live births. At the same time, it may also lead to a decrease in the time of progress to the next live birth after foetal loss or still birth as there is impetus for the next birth after a foetal loss or still birth.

Model 2 includes the sex of the first child as predictor of the probability of progression to the second child and it is evident that the sex of the first child has a statistically significant impact on the probability of progression to the second child even after controlling other predictor variables. The probability of progression to the second child in a given time is found to be more than 4 per cent higher in women whose first child is female as compared to women whose first child is male. It may also be seen from the table that the -2log-likelihood of Model 2 is smaller than the -2log-likelihood of Model 1 which indicates that the inclusion of the sex of the first child as the predictor variable increases the explanatory power of the Model.

Discussions

This study provides critical insights into the dynamics of SBI among ever-married women in UP, India, using non-parametric KM and semi-parametric CPH survival analysis techniques. The analysis not only describes the median timing of second birth but also identifies key socio-demographic and behavioural factors influencing the SBI. The study shows the median SBI is 32 months. Our findings align with previous state-level analyses which reported, interval between subsequent birth approximately 32 months and significant variation across socioeconomic and educational groups (Singh et al, 1993). The average second birth interval estimated in our study is also close to the WHO recommended birth interval of 24-33 months (WHO, 2007). The analysis shows that SBI varies by different socioeconomic, and other characteristics of women in Uttar Pradesh.

The analysis confirms that the age of woman at first birth is a significant predictor of the SBI, with women initiating childbearing after age 20 having longer SBI. This aligns with previous studies, which show delayed first births are often associated with higher autonomy and more deliberate fertility planning (Ní Bhrolcháin and Beaujouan, 2012).

Religious affiliation emerged as a strong predictor of SBI. Muslim women have shorter birth intervals compared to Hindu. This could reflect distinct cultural norms around family size, contraceptive acceptance, and reproductive decision-making. This finding is almost consistent with other studies (Bhalotra and Van Soest, 2008).

This study shows there exists an inverse relationship between educational attainment and the hazard of second birth in Uttar Pradesh, India. The study reveals that women with secondary or higher education experienced significantly longer SBI than women having less than secondary education. Education is likely to enhance the awareness and knowledge of women about contraceptive options and improves their decision-making capacity leading to the delays in the first birth, and creating conditions for longer birth spacing. Similar findings have also been reported by Singh (1993), who has observed that higher educational attainment of women is associated with longer birth intervals in Uttar Pradesh. On the other hand, the impact of the standard of living, measured in terms of the household wealth index index has been found to be low uniformly across all categories, but women from the richest households are found to have a significantly lower hazard of a second birth which suggests longer duration between the time of the first live birth and the time of the second live birth, possibly through better access to healthcare, education, and family planning services.

The study has also found that that women residing in rural areas of the state face a significantly higher risk of having second live birth in a short interval compared to urban women. This disparity may be attributed to limited access to reproductive health services, lower educational attainment, and the prevalence of pronatalist norms that encourage early and closely spaced childbearing in rural areas (Stephenson et al, 2007). In contrast, urban women often benefit from greater exposure to health information, improved healthcare infrastructure, and enhanced social and economic mobility, all of which contribute to delayed and better-spaced births. Social class also appears to influence birth spacing. Women from OBC and other social classes had marginally longer SBI compared to SC/ST and the findings align with the results of earlier studies (Singh, 1993). These differences are statistically significant. Women who experienced terminated pregnancies (either miscarriage, stillbirth, or abortion) have longer SBI. This could reflect physical or emotional recovery periods following a pregnancy loss, or more cautious fertility planning thereafter (Abebe and Yohannis, 1996). These findings emphasise the need for improved postpartum counselling and mental health support to mitigate the adverse effects of pregnancy loss on future reproductive behaviour.

The sex of the first child has been found to have statistically significant influence on the time of the second live birth. The study reflects the influence of prevailing son preference in many societies, where parents, particularly in the context in which strong cultural or economic values are placed on the male offspring, often accelerate subsequent childbearing when the first child is a female in the expectation that the next child will be a son. Consequently, the length of the second birth interval is influenced by the sex of the first child highlighting the continuing impact of gender preferences on reproductive behaviour.

The findings of this study have important implications for public health policy and planning for reproductive health services in Uttar Pradesh. Investing in the education of women, especially, secondary, and higher education can be a powerful lever to delay and better space births. Programmes should focus on rural women, Muslim population, and those with lower education levels, who are more likely to have shorter SBI. Postpartum family planning initiatives must emphasise the timing and purpose of contraceptive use, not just access. Media campaigns and community-level interventions must consider religious and cultural beliefs to effectively influence birth spacing behaviour. Women who experience pregnancy loss need targeted reproductive and psychological health interventions to support informed future fertility decisions.

Conclusion

This study highlights the importance of socio-economic, cultural, and demographic factors that affect the progression from first birth to second birth in Uttar Pradesh. The use of non-parametric and semi-parametric survival analysis provides a deep understanding about the determinants of SBI, with key insights into how various factor influence the progression from first to second birth. The findings highlight the critical role of education, delayed first births, and wealth in achieving longer birth intervals, and further emphasize the need for targeted family planning strategies tailored to the unique needs of different population segments. These insights can inform more responsive and equitable reproductive health policies that align with both health outcomes and fertility reduction goals in the most populous state of India.

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