Factors Affecting Preferred Birth Interval in Iran: Parametric Survival Analysis

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Abstract: Birth interval has received special attention in public health and demographic researches because of its implication in fertility, maternal and child health. Study of preferred birth interval also is a very important issue since it demonstrates people's fertility attitude. In a cross sectional study, a structured questioner was used to collect 5260, Iranian pre-married youths in 2014, by multi-stage stratified sampling. In this study, influential factors on youths' preferred birth interval investigated by non-parametric and parametric survival analysis and outcomes compared among Iranian provinces with low and high fertility levels. Results showed that factors affect on youths' preferred birth interval were different between two province categories; youths' Gender, place of residence, educational level, job status, ideal number of children, family income, sex preference, and age had significant effects on youths' preferred birth interval in low fertility level provinces. However in high fertility level provinces, only youths' place of residence, job status, family income, and age had significant effects on their preferred birth interval (p-value<0.05). Youths lived in urban area, with higher income and in older ages had longer preferred birth interval compared to those lived in rural area, with lower income and in younger ages in both province categories.

Key-words: Preferred birth intervals, Pre-married youth, Kaplan-Meier, Log-Rank test, Parametric survival analysis, Iran.

1 Introduction

Fertility is an important component of population dynamic which plays a major role in changing the size and structure of a given population [1]. Fertility analysis is an important issue for policy makers to develop guidance for population control and also to evaluate family planning programs [2]. The number of children each woman (or couple) bear during her childbearing years in the population, and the ages at which the woman has given birth to her children are the basic factors which determine population growth. While the former relationship is obvious, the latter (that determines timing or birth spacing), means that for the same number of children born per woman, mothers who give birth during their later childbearing years contribute more towards population control than those who give birth to their children early in their life [3].

Birth interval (spacing) is the length of time between two successive alive births [4]. Birth interval analysis is more susceptible technique for measuring fertility than other conservative methods of measuring fertility [5]. Pattern of birth intervals not only provides pace of child bearing but also chances of transition to higher parity [6].

Since birth spacing has the important role on the health of mothers and children, it also merits special attention in public health. Many researches demonstrated that, shorter birth intervals may not provide enough time for mothers to restore nutritional reserves that are needed for adequate fetal nutrition and growth. Fetal growth retardation can result in low birth weight, which adds to the risk of children premature death. Children born too close together compete for resources and maternal care, including breastfeeding [7]. It is argued that when a newborn comes, it is likely that the family will invest more of its limited resources in the form of care to the newborn and the other children are more likely to suffer or merely receive inadequate share of the resources distributed among siblings [8-9].

Closely spaced births have a potentially devastating impact on both the individual and the society. This pattern, combined with high levels of unplanned fertility, makes it difficult for women to become productive members of society, thereby limiting their contribution to economic development [7]. On the other hand, optimal birth spacing yields the greatest health, social, and economic benefits for the family [10]. Although previous research findings advocate an interval length of 2 years between two consecutive births for a better maternal and child health, recent evidence showed that births should be spaced at three to five years apart to ensure maximum health benefits from newborns, and older children [10]. Children born three to 5 years after a previous birth are about 2.5 times more likely to survive through age 5 than children born before 2 years [7]. A study in 2000 by the Latin American Center for Perinatality and Human Development supplements (the DHS study on child spacing), indicated that women who have births at 27 to 32 compared to 9 to 14 month birth intervals are 1.3 times more likely to avoid anemia, 1.7 times more likely to avoid third-trimester bleeding, and 2.5 times more likely to survive childbirth [11]. Birth spacing is affected by various cultural norms. Including the pressure to prove the ability of one's fertility (and virility) by having the first child early, having many children, and having them in rapid succession.

Education has always been an important variable in the sociological and economical literature of fertility [12]. It is considered to be one of the most important factors having an indirect influence on birth interval length through its impact on one or more of the bio-behavioral variables [13]. In 38 of 51 countries with DHS data, illiterate women were more likely than educated women to space births less than 3 years [14]. In a survey conducted in rural Saudi Arabia, mother's education and age marriage were the most widely determinants of birth intervals [15-16]. Among other influential factors, marriage age of mothers is considered to be an important variable in the fertility process which is negatively associated with the length of birth interval [15, 17-18]; younger women had shorter birth interval than older ones [13-14].

There are some urban-rural differentials' rural women less likely than urban women to have intervals over five years [13]. Couples who prefer son tend to have their next child soon after the birth of a daughter. In 2002 among 55 countries conducted demographic and health survey, women were more likely to have a next child within 3 years after the birth of a daughter than after a son's birth [14]. The median number of birth months for a newborn increased when a wealth quartile is shifted from the lowest to the highest [4].

Birth spacing has become a main strategy of the health promotion program for mothers and children over the past two decades in Islamic Republic of Iran [19]. So many researches were conducted to study determinants of birth intervals, recent years; Hajian et al. (2009) showed that there were significant correlation between birth interval with maternal age, duration of breast feeding, sex of previous child, history of alive children, history of infant mortality of the previous child, type of contraception used, regular attendance at a family planning clinics [20]. Other study by Fallahian et al. (1993) found the duration of breastfeeding and the type of contraceptive used were factors significantly associated with child intervals [21]. Rasekh and Momtaz (2007) stated that the encouraging women for higher education and giving opportunity to them to get employed may be the influential way of extending their birth spacing which result in slowing down fertility in Ahvaz, Iran ([22].

Intentional long birth spacing limits childbearing and it is known as 'spacing behavior' of fertility. Although there are many studies about birth interval and influential factors on it, little is known about preferred birth interval in different cultural settings, at different stages of fertility transition, about the contribution of interval goals to the fertility transition, their covariates, and their interaction with goals about family size. Preferred birth interval often is ignored in studies of fertility transition [23]. A first step in understanding this aspect of reproductive motivations is to measure people's goals on birth interval. Not only there is a lack of data on the preferred birth interval in Iran, little is known about the perception of Iranian youths regarding to it [24].

This study, therefore, aimed to identify the determinants of preferred birth interval among pre-married youths by parametric survival methods, and compare them between two province groups (province with low and high fertility level), in Iran. To do so, introduction of data and methods displays in Section (2), results and discussion are presented in Section (3) and (4), respectively.

2 Materials and Methods

2.1. Data

In a cross-sectional study, the structured questionnaire was completed by 5260 pre-married youths including 2610 males and 2650 females in 31 provinces in Iran to collect their demographic, fertility attitudes and socio-economic characteristics in 2014. The sample was selected by multi-stage stratified random sampling from those who were referred to public health centers for doing pre-marriage tests. In first stage, 31 provinces were selected, then, in second stage, 3 Shahrestan (sub-province) of each province based on size and distribution of population by probability proportional to size sampling were collected. Minimum (180) and maximum (1556) samples were collected from Kohkiloye and Tehran province, respectively. Male and females were selected randomly within each center and answered a self-reported questionnaire with careful monitoring system [25].

1.2. Statistical analysis

In this study, Kaplan-Meier (KM) estimator was used for univariate analysis to describe preferred birth interval between gender, place of residence, age, educational level, job status, Ideal Number Children (INC), family income, and sex preference for two province categories; provinces with $1.2 \leq TFR \leq 1.6$ (low fertility level) and province with $2.5 \leq TFR$ (high fertility level). Since different provinces have different levels of socioeconomic development and miscellaneous culture, which may lead to various birth interval, in this article two group of provinces considered. TFR considered for dividing provinces, because studies showed that provinces with low fertility have the upper modernization level which affects fertility behavior [26].

To compare preferred birth interval among these covariates, Log-Rank test were used separately for both province groups.

For investigating effects of all covariates on preferred birth interval simultaneously, parametric survival models were also used. Usually, proportional hazard Cox regression are applied for modeling event times in demographic research [28-30]. Cox model is generally described as Equation (1):

$$h(t) = h_0(t)exp(b_1x_1 + ...+ b_n x_n \qquad (1)$$

where $h(t)$ denotes the hazard given the values of the n covariates ($x_1, x_2,\dots ,x_n$) for the respective case and the respective survival time (t). The term $h_0(t)$ is called the *baseline hazard*; it is the hazard for the respective individual when the values of all the covariates are equal to zero. The application of the Cox model allows us to determine the relationship between the hazard rate and covariates without specifying baseline hazard function. The proportional hazard model assumes that the hazard function for an individual depends on the values of the covariates and the value of the baseline hazard.

As a result, given two individuals, with particular values for the covariates, the ratio of the estimated hazards over time will be constant. According to simplicity of Cox model this is applied in many studies; however to achieve correct model and effective results proportional hazard (PH) hypothesis must be confirmed. In many studies this important hypothesis, not confirmed and in this situation, parametric survival model can be used; it is assumed that there is the linear relation between log (t) and covariates as Equation (2):

$$\log T = a_0 + \sum_{j=1}^{p} a_j x_j + \sigma\varepsilon \qquad (2)$$

In this Equation x_j (j=1,…, n), a_j(j=1,…, p), and σ ($\sigma > 0$) are covariates, model coefficients, and the scale parameter, respectively. ε is an error component that is a random variables with probability distribution function $g(\varepsilon, d)$ and known survival $G(\varepsilon, \mathbf{d})$ with unknown **d** parameter. So survival times depend on both covariates and g. In this equation g can be Exponentional, Weibul, LogLigistic, LogNormal, and Gamma distribution, depends on the data.

Assume that T_0 and T_1 are the survival times for two individuals with x=0 and x=1. So $T_0 = \exp(a_0 + \sigma\varepsilon)$ and $T_0 = \exp(a_0 + T_1 = \exp(a_0 + a_1 + \sigma\varepsilon) = T_0\exp(a_1)$; if $a_1 > 0$, then $T_1 > T_0$, and if $a_1 < 0$, then $T_1 < T_0$. This means that survival time can be occurred faster or slower respect to x [27].

In this article, first Cox model fitted to the data, but PH hypothesis is not confirmed for three covariates (including age, educational level, and INC), so parametric survival model was applied to gain an efficient results.

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2. Result

Mean preferred birth interval of provinces with low fertility level ($1.2 \leq \text{TFR} \leq 1.6$) and high fertility level ($2.5 \leq \text{TFR}$) were 3.83 ± 0.03 and 3.60 ± 0.07 years, respectively. In this article gender, place of residence, age, educational level, job status, INC, family income, and sex preference of both province categories were considered as covariates which can affect their preferred birth interval. Table (1) shows frequency distribution of covariates for both province categories; almost equal percentages of males and females were in both province categories. Almost 94 and 73 percentages of cases in provinces with low and high fertility level lived in urban areas, respectively. 65 percentages of cases in both province categories had 20-29 years old. Youths with university educational level in provinces with low fertility level (51.6%) were more than ones who lived in provinces with high fertility level (29.3%). 60.3 percentages of youths in provinces with low fertility level compared to 40.8 percentages of who lived in provinces with high fertility level were employed. Most of the cases in both province categories had 1 or 2 INC; only 1.6 percentages of youths lived in provinces with low fertility level desired 5 or more children. 82.6 percentages of youths in provinces with high fertility level had low family income. Most of youths in provinces with low fertility level did not have sex preference (54.6%) comparing to ones who lived in provinces with high fertility level (34.7%).

Table 1. Youths' Demographic and socio-economic characteristics

Variable		Province Category			
		Low fertility level $1.2 \leq TFR \leq 1.6$		High fertility level $TFR \geq 2.5$	
		Freq	*Percent*	*Freq*	*Percent*
Gender	Male	2359	49.6	251	49.7
	Female	2396	50.4	254	50.3
Place of Residence	Urban	4449	93.6	366	72.5
	Rural	306	6.4	139	27.5
Age	10-19	563	11.8	136	26.9
	20-29	3089	65.0	328	65.0
	30-39	990	20.8	40	7.9
	40<=	113	2.4	1	.2
Educational Level	Illiterate	23	.5	12	2.4
	Primary & Middle School	515	10.8	134	26.5
	High School/Diploma	1747	36.7	209	41.4
	Associate & BA/BS	2013	42.3	128	25.3
	MA/MS & PhD	443	9.3	20	4.0
	Religious Studies	14	.3	2	.4
Job Status	Employed	2865	60.3	206	40.8
	Student	861	18.1	103	20.4
	Home Helper	636	13.4	120	23.8
	Searching a Job	330	6.9	53	10.5
	Other	63	1.3	23	4.6
Ideal Number of Children (INC)	1-2	3887	81.7	288	57.0
	3-4	793	16.7	170	33.7
	5<=	75	1.6	47	9.3
Family Income	Low	2380	50.1	417	82.6
	Moderate	2229	46.9	83	16.4
	High	146	3.1	5	1.0
Sex Preference	Yes	2157	45.4	330	65.3
	No	2598	54.6	175	34.7
Total		4755	100.0	505	100.0

KM survival estimates and Log-Rank test for youths' preferred birth interval are shown in Table (2). These indicators help us to understand the average and median of youths' preferred birth interval among various categories of covariates, for both province categories. As this table shows, place of residence,

Table 2. Kaplan-Meier estimates of youths' preferred birth interval by covariate

Variable		Province Categories					
		Low fertility level $(1.2 \leq TFR \leq 1.6)$			High fertility level $(TFR \geq 2.5)$		
		Mean	Std. Error	Median	Mean	Std. Error	Median
Gender	Male	3.662	.039	3.000	3.275	.092	3.000
	Female	3.997	.039	4.000	3.929	.108	4.000
	Log Rank	P-value <0.000			P-value Log Rank<0.000		
Place of Residence	Urban	4.007	.113	4.000	3.691	.157	3.000
	Rural	3.819	.029	3.000	3.571	.080	3.000
	Log Rank	P-value =.078			P-value =.410		
Age	10-19	4.220	.089	4.000	4.051	.166	3.000
	20-29	3.840	.035	3.000	3.476	.082	3.000
	30-39	3.585	.055	3.000	3.125	.197	3.000
	40<=	3.796	.180	3.000	4.000	.000	4.000
	Log Rank	P-value <0.000			P-value <0.001		
Education Level	Illiterate	3.174	.342	3.000	3.083	.514	2.000
	Primary & Middle School	3.792	.093	3.000	3.806	.158	3.000
	High School/Diploma	3.944	.048	3.000	3.522	.114	3.000
	Associate & BA/BS	3.769	.040	3.000	3.625	.126	3.000
	MA/MS & PhD	3.790	.091	3.000	3.400	.197	3.000
	Religious Studies	2.500	.203	2.000	2.500	.500	2.000
	Log Rank	P-value <0.000			P- value =0.317		
Job Status	Employed	3.694	.035	3.000	3.252	.094	3.000
	Student	4.037	.065	4.000	3.922	.181	4.000
	Home Helper	4.137	.083	4.000	3.917	.161	3.000
	Searching a Job	3.918	.108	4.000	3.792	.237	3.000
	Other	3.714	.260	3.000	3.261	.268	3.000
	Log Rank	P-value <0.000			P-value <0.000		
Ideal Number of Children (INC)	1-2	3.913	.031	3.000	3.837	.101	3.000
	3-4	3.535	.065	3.000	3.371	.113	3.000
	5<=	2.733	.160	2.000	3.021	.194	3.000
	Log Rank	P-value <0.000			P-value <0.000		
Family Income	Low	3.839	.040	3.000	3.568	.081	3.000
	Moderate	3.841	.040	3.000	3.771	.160	4.000
	High	3.548	.150	3.000	3.800	1.068	4.000
	Log Rank	P-value =0.189			P-value =0.572		
Sex Preference	Yes	3.768	.042	3.000	3.509	.092	3.000
	No	3.883	.037	3.000	3.783	.116	3.000
	Log Rank	P-value =0.046			P-value =0.078		
Total		3.831	.028	3.000	3.604	.072	3.000

and family income did not have significant effects on youths' preferred birth interval in both province categories; youths' educational level and sex preference only had significant effects on preferred birth interval for those lived in low fertility level provinces (p-value<0.05). Gender, age, job status, and INC had significant effects on youths' preferred birth interval for both province categories; females, the youngest individuals, and those wanted 1 or 2 children had the largest preferred birth interval in both province categories. Home helper and students had the largest preferred birth interval comparing to other job status categories in low and high level fertility provinces, respectively.

To investigate effects of all covariates on preferred birth interval simultaneously, parametric survival model were used for both province categories. For selecting the best model among Exponential, Weibul, LogLogistic, LogNormal, and Gamma models, all of them were fitted to data. Akaike Criteria (AIC) of all models for both province categories are presented in table (3); based on AIC, LogNormal were selected as the best ones for both province categories.

Table 3. AIC index for parametric models

Model	Low fertility level $(1.2 \leq TFR \leq 1.6)$	High fertility level $(TFR \geq 2.5)$
Exponential	10573.72	1131.94
Weibul	7054.18	639.486
LogLogistic	6216.53	591.83
LogNormal	6201.49*	584.64*
Gamma	6220.38	585.96

*Minimum value

Table 4. The result of Log-Normal model for youths' preferred birth interval by province

Variable		Province Categories							
		Low fertility level $(1.2 \leq TFR \leq 1.6)$				High fertility level $(TFR \geq 2.5)$			
		a	*SE*	χ^2Statistic	P_value	*a*	*SE*	χ^2Statistic	P_value
Intercept		1.2172	0.1551	61.59	<.0001	1.0059	0.3824	6.92	0.0085
Gender	Female	0.0814	0.0201	16.46	<.0001	0.0062	0.0705	0.01	0.9303
	Male (ref)								
Place of residence	Rural	-0.1289	0.0326	15.63	<.0001	-0.1066	0.0543	3.86	0.0494
	Urban (ref)								
Educational level	Illiterate	-0.0321	0.1854	0.03	0.8624	-0.015	0.3919	0	0.9694
	Primary & Middle School	0.2118	0.147	2.08	0.1496	0.0606	0.362	0.03	0.867
	High School/Diploma	0.286	0.1455	3.87	0.0492	-0.0205	0.3581	0	0.9543
	Associate & BA/BS	0.3678	0.1454	6.4	0.0114	0.0431	0.3595	0.01	0.9047
	MA/MS & PhD	0.4439	0.1472	9.1	0.0026	0.4803	0.3771	1.62	0.2029
	Religious Studies (ref)								
Job Status	Employed	-0.0441	0.0255	2.98	0.0842	-0.0706	0.0798	0.78	0.3759
	Home Helper	-0.1463	0.03	23.73	<.0001	-0.0945	0.081	1.36	0.2431
	Searching a Job	-0.0395	0.0352	1.26	0.2618	-0.2259	0.0947	5.69	0.0171
	Other	0.0237	0.0718	0.11	0.7409	-0.0255	0.1301	0.04	0.8445
	Student (ref)								
Ideal Number of Children (INC)	1-2	0.3075	0.0637	23.33	<.0001	0.1066	0.0873	1.49	0.2222
	3-4	0.0935	0.0656	2.03	0.1542	-0.0688	0.0913	0.57	0.4506
	5<=								
Family Income	Low	-0.0338	0.0164	4.25	0.0391	-0.1246	0.063	3.91	0.048
	High	0.0441	0.0468	0.89	0.3465	0.0112	0.2604	0	0.9655
	Moderate (ref)								
Sex Preference	No	0.0834	0.0159	27.64	<.0001	0.0052	0.0504	0.01	0.9174
	Yes (ref)								
Age		-0.0317	0.0016	399.48	<.0001	-0.0226	0.006	14.13	0.0002
Scale		0.5295	0.0055			0.4962	0.0162		

Table (4) presents the results of fitted model by province; as this table shows, gender, place of residence, educational level, job status, INC, family income, sex preference, and age had significant effects on youths' preferred birth interval in low fertility provinces; Based on model coefficient (***a*** column) in these provinces, females, youths with high school and above educational level, 1 or 2 INC, and no sex preference compared to males, youths with religious study educational level, 5 or more INC, and sex preference had longer preferred birth interval.

Versus youths lived in rural areas, who are home helper, and with low family income, preferred to decrease their birth intervals compared to whom lived in urban areas, who are student and had moderate family income. Also, by increasing youths' age, their preferred birth interval decreased.

In province with high fertility level, only youths' place of residence, job status, family income, and age had significant effects on their preferred birth interval. Youths lived in rural areas, had low family income, and searching a job, preferred to decrease birth intervals compared to whom lived in urban areas, had moderate family income and were students. By increasing youths' age, their preferred birth interval decreased.

4 Conclusion

Timing and spacing of births are vital issues which should be studied dynamically for several reasons, including an understanding of completed family size as well as maternal and child mortality [31]. Modeling fertility data is one of the greatest interests in population studies.

The social influence theory suggests that preferred birth interval may be influenced by the advices that people receive from significant ones. Those who receive these advices are more likely to prefer longer birth intervals [32]. The motivational forces that drive the fertility transition in developing countries may include both couples' desire to stop childbearing after reaching their preferred family size and their desire to lengthen birth intervals, either as a goal by itself or as a means to achieve small family sizes [2].

In many studies socio-economic factors such as the women's place of residence, educational level, job status, and income have been correlated with birth interval; In 38 out of 51 countries by studing DHS data, illiterate women were more likely than educated women to have shorter birth intervals [11]. Rural residence is also associated with short birth intervals in 51 out of 55 countries. For example, in Tanzania, urban women were 18 percent less likely to have conceived and closed interval than rural women [33]. The effect of maternal employment on spacing is less clear; in some settings it appears to be associated with shorter spacing. The nature of their work is perhaps more important. Employment in the formal and modern sector has been found to be related to longer spacing [11, 33].

Considering importance of preferred birth interval, very few studies have investigated the various aspects of it in all over the world. The objective of this study was to investigate the effect of selected factors on preferred birth interval among pre-marriage youths in Iran and comparing these factors between two province categories. To do this, Kaplan-Meier and Log-Rank test were used as univariate survival analysis, and parametric survival model was applied for multivariate analysis.

The results showed the different patterns of factors affected on preferred birth interval between two province categories. In provinces with low fertility level ($1.2 \leq \mathrm{TFR} \leq 1.6$), all covariates including gender, place of residence, educational level, job status, INC, family income, sex preference, and age had significant effects on preferred birth interval. Although in provinces with high fertility level ($2.5 \leq$ TFR), only place of residence, job status, age, and family income had significant effects on preferred birth interval. This different pattern may be rooted on variant level of modernity in these provinces.

In low fertility level provinces by increasing education level the preferred birth interval also increased. Higher educational level is usually linked to better health awareness and longer birth intervals [15, 19, 34]. These results confirmed by many studies such as [11, 19-20, 22, 33, 35]. Quantity/ Quality theory of fertility may also affect spacing behavior similarly as it affects stopping behavior. Usually birth intervals are expected to be short for lower income group than higher income group [36]; This is as same as our findings.

In these provinces, age increasing leads to shorter preferred birth interval; this could be due to younger women being more likely to have children for a variety of reasons such as greater fecundity and being early on in the family building process. On the other hand, older women are later in their childbearing process and are likely to have achieved their desired family size and hence likely to have shorter subsequent spacing; they are also likely to be less fertile leading to longer spacing [1, 15-16].

Youths lived in urban areas had greater preferred birth interval than who lived in rural areas; In 51 out of 55 countries surveyed in DHS, women who lived in rural areas were more likely than women in urban areas to have birth intervals shorter than 3 years [14]. Better social services and access to information, education and employment opportunities could have brought about variation by place of residence.

Home helper youths with sex preference and 5 or more desired children in low fertility level provinces, preferred to decrease birth intervals; these results also gain by many studies [18, 20, 22].

In provinces with low fertility level, females preferred greater birth interval than males; may be this is because of more awareness of the risk of close birth interval among females than males.

In high fertility level provinces by increasing age, and family income same as low fertility level provinces, preferred birth interval decreased and youths lived in urban areas had greater preferred birth interval than who lived in rural areas. Youths were searching a job preferred closer birth interval than other job status categories.

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References

[1] Yohannes, S., Wondafrash, M., Abera, M., & Girma, E. (2011). Duration and determinants of birth interval among women of child bearing age in Southern Ethiopia. BMC pregnancy and childbirth, 11(1), 38.

[2] Kamal, A., Pervaiz, M. K. (2012). Determinants of Higher Order Birth Intervals in Pakistan. Journal of Statistics; 19(1):15-24.

[3] Rajaretnam, T.(1990). How delaying marriage and spacing births contributes to population control: an explanation with illustrations. J fam welfare; 34: 3-13.

[4] Central Statistical Agency [Ethiopia] and ORC Macro (2006): Ethiopia Demographic and Health Survey 2005. Addis Ababa, Ethiopia and Calverton, Maryland, USA: Central Statistical Agency and ORC Macro.

[5] Nath, D.C., Leonetti, D. L. and Steele, M. (2000). Analysis of birth intervals in a non-contracepting Indian population: An evolutionary ecological approach. Journal of biosocial Science, 32, 343-354.

[6] Pillai, V. K. (2010). Child spacing and contraception among the poor in Zambia.

[7] Siegel, J. S. (2011). The demography and epidemiology of human health and aging. Springer Science & Business Media.

[8] Hailu, D., & Gulte, T. (2016). Determinants of Short Interbirth Interval among Reproductive Age Mothers in Arba Minch District, Ethiopia. International journal of reproductive medicine.

[9] United States Agency for International Development (USAID), Strengthening Family Planning Policies and Programs in Developing Countries, United States Agency for International Development (USAID),Washington, DC, USA, 2005.

[10] World Health Organization and Department of Making Pregnancy Safer, Technical Consultation Report on Birth Spacing (2005), WHO, Geneva, Switzerland, , http://www.who.int/maternal child adolescent/documents/birth spacing.pdf.

[11] Setty-Venugopal, V., & Upadhyay, U. D. (2002). Birth spacing: three to five saves lives. Population Reports. Series L: Issues in World Health, (13), 1-23.

[12] Shayan, Z., Ayatollahi, S. M. T., Zare, N., & Moradi, F. (2014). Prognostic factors of first birth interval using the parametric survival models. Iranian journal of reproductive medicine, 12(2), 125.

[13] Saumya R, John T, Ian A: Correlates of Inter-birth Intervals: Implications of Optimal Birth Spacing Strategies in Mozambique. Population Council; 2006.

[14] Vidya S, Ushma U (2002). Birth spacing: three to five saves lives. Population reports, series L, No. 13. Baltimore, Johns Hopkins Bloomberg School of public health, population information program, summer.

[15] Al Nahedh, N. N. (1999). The effect of sociodemographic variables on child-spacing in rural Saudi Arabia.

[16] Bella, H., & Al-Almaie, S. M. (2005). Do children born before and after adequate birth intervals do better at school?. Journal of tropical pediatrics, 51(5), 265-270.

[17] Clegg, E. (2001). Starting, spacing and stopping in the reproductive histories of outer Hebridean families. Journal of biosocial science, 33(03), 405-426.

[18] Nahar, L., Rahman, M. (2006). Changes in socio-economic differentials of age at marriage and first birth during 1983-1994 in Matlab Bangladesh.Demography India, 35(1), 1-14.

[19] Fallahzadeh, H., Farajpour, Z., & Emam, Z. (2013). Duration and determinants of birth interval in Yazd, Iran: a population study. Iranian journal of reproductive medicine, 11(5), 379.

[20] Hajian-Tilaki KO, Asnafi N, & Aliakbarnia-Omrani F. (2009), The Patterns and determinants of birth intervals in multiparous women in Babol, Northern Iran. Southeast Asian J Troped Public Health; 40: 852-860.

[21] Fallahian, M., Kazemnegat, A., & Ebrahimi, N. (1993). Determinant of short birth interval. J Behboud Kermanshah Med Sci Univ Iran, 18, 35-48.
[22] Rasekh, A., & Momtaz, M. (2007). The determinants of birth interval in Ahvaz-Iran: a graphical chain modelling approach. J Data Sci; 5: 555-576.
[23] Pritchett, L. H. (1994). Desired fertility and the impact of population policies. Population and Development Review, 1-55.
[24] Bagheri, A and Saadati M (2016). Women's Preferred Birth Interval in Iran: Non-Parametric Survival Analysis. Third European Population Conference 2016 (EPC).
[25] Kazemipour, Sh (2014). Study of childbearing attitudes and its social, economical and cultural factors for youth in their marriage threshold and 15-49 year old ever married women, Statistical research center, Tehran, Iran.
[26] Abbasi-Shavazi, M. J., McDonald, P. and M. Hosseini Chavoshi (2009). Family Change and Continuity in Iran: Birth Control Use before First Pregnancy. Journal of Marriage Family 71(5): 1309–1324.
[27] Collett D. (2003). Modelling survival data in medical research. 2nd ed. London: Chapman and Hall.
[28] Bracher, Michael and Gigi Santow. (1998). Economic independence and union formation in Sweden. Population Studies 52(3):275-294.
[29] Choe, Minja K., Shyma Thapa and Vinod Mistra, (2004). Early marriage and early motherhood in Nepal. Journal of Biosocial Sciences ;00: 1-20.
[30] Arnaldo, Carlos. (2004). Ethnicity and Marriage Patterns in Mozambique. African Population Studies vol. 19(1): 143-164.
[31] Gyimah, S. O. M. (2002). The dynamics of spacing and timing of births in Ghana. PSC Discussion Papers Series; 16(4), 1.
[32] Kim, Y. M., Kols, A., & Mucheke, S. (1998). Informed choice and decision-making in family planning counseling in Kenya. International Family Planning Perspectives, 4-42.
[33] Mturi, A. J. (1997). The determinants of birth intervals among non-contracepting Tanzanian women.
[34] Sakait, M., & Ansari, L. (1996). Community survey on use of contraceptive methods in Saudi women in Riyadh region. J Fam Commun Med, 3, 81-97.
[35] Chakraborty, N., Sharmin, S., & Islam, M. A. (1996). Differential pattern of birth interval in Bangladesh. Asia Pacific Popul J, 11, 73-86.
[36] Van Bavel, J., & Kok, J. (2004). Birth spacing in the Netherlands. The effects of family composition, occupation and religion on birth intervals, 1820–1885.European Journal of Population/Revue Européenne de Démographie, 20(2), 119-140.