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Ideal Birth Interval of Iranian Married Women

Mahsa Saadati[1], Arezoo Bagheri[1*]

[1]National Population Studies & Comprehensive Management Institute No.5, Second street, Pakestan Street, Shahid Beshshti Avenue, Tehran, Iran. Postal Code: 1531635711.

Abstract: Fertility is one of the important factors affecting population growth rate. It is affected by many socio-economic variables and individual's preferences. Childbearing desires, ideal number of children and ideal birth interval are three dimensions of fertility preferences. Short birth interval has inverse relation with infant and maternal mortality, and on the other hand it can increase fertility rate. So in this article ideal birth interval was studied. There were 6177 Iranian 15-49 aged married women collected by a structured questioner and multi-stage stratified sampling in the year 2014. Kaplan-Meier and Log-Rank test as non-parametric survival analysis tools were used to analyze data by SPSS 20. Mean and median of ideal birth interval were 4.323 and 4.000 years, respectively. This interval was significantly different between woman's place of residence, educational level, activity, number of ever born children and family income (p -value < 0.05). Under secondary, unemployed women and who lived in rural and family with under 1 million income and 1 or 2 children, had the largest ideal birth interval in compare with other levels of this variables.

Keywords: *Ideal birth intervals; Kaplan-Meier; Log-Rank test; Women; Iran*

Introduction: One of the important components of population dynamics that has an influential role in altering the size and structure of a given population is Fertility [1]. To control population and evaluate family planning programs, fertility analysis is very vital for policy makers [2]. During early fertility transitional period, Knodel (1987) believed that there were three fertility inhibiting behaviors of starting, spacing and stopping [3]. The time distance between two successive live births is called Birth interval (spacing) [4]. To measure fertility, Birth interval patterns present the speed of child bearing and the possibility of shifting to higher parity [5,6]. Intended long birth interval which is known as 'spacing behavior' of fertility causes limitations to child bearing. Small family size and long birth interval are two of the most important messages of health education [7]. Short birth spacing has been related to poor health results, which include the mortality of infant, child and maternal.

It has been shown by many researchers that a risk factor for pre-term delivery and neonatal death is inter-pregnancy spacing [8]. There is not a universal optimal birth interval; Zhu et al. (1999) indicated that to prevent the opposing prenatal consequences, the optimal birth interval is 18-23 months [9, 10]. To ensure survival through childhood, WHO (2005) stated that the best birth interval is 5 years [11]. Different risk factors have been identified in different studies which contribute to the birth interval. To diminish the risk of neonatal mortality, according to the resultsof meta-analysis and Demographic Health Survey (DHS) studies, birth intervals of 36-59 months are optimal, though resulted shorter spacing births reported in some studies [12-14]. Al-Nahedh (1999) and Bella (2005) found a significant relation between socio- demographic variables and birth interval in rural Saudi Arabia [15, 16]. Education and marriage age of women are the most widely influential factors on birth intervals. In the fertility process, mother's marriage age is indicated to be a vital variable and negatively related to birth interval [15, 17-18]. However, marriage age may have a different effect on diverse birth intervals. West (1987) resulted that at

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Corresponding author details:
E-mail address: arezoo.bagheri@psri.ac.ir
Tel: +982188506562

first birth the younger a woman is, the greater her transition probability [19]. Education has also been an effective variable in the socio- economic fertility literature [20]. Many Iranian researches were studied birth interval determinants; Hajian et al. (2009) defined a significant correlation between women's birth interval and age, breast feeding duration, previous child sex, history of current births, history of previous infant mortality, type of contraception, systematic attendance at a family planning clinics and parity [21]. Fallahian et al. (1993) also stated that the breastfeeding duration and the type of contraception were effective factors related to birth intervals [22]. Rasekh and Momtaz (2007) resulted that to slow down fertility in Ahvaz, Iran, the encouraging women for higher education and giving employment opportunity could be effective [23].

Over the past two decades in Islamic Republic of Iran, birth intervals have become a main policy of the health promotion program for women and children [9]. Although there are many studies about birth interval and factors which are influence on it, little is identified about ideal birth interval and its effects on fertility rate and family size in different countries. Also there are a little study about effects of influential covariates on ideal birth interval [24]. In Iran also there is not sufficient data and surveys to study women's ideal birth interval and their influential factors. So the aim of this study was identified patterns of this interval among some selected covariates between women in reproductive age in Iran by nonparametric survival analysis.

Materials & Method

6177 married, 15-49 years old women were selected by multi-stage stratified random sampling in 31 provinces in Iran. The structured questionnaire included demographic, fertility history and socio-economic characteristics was used to collect data in a cross- sectional study, in 2014. The women were selected by multi-stage stratified random sampling from those who were referred to vaccinate their children to public health centers. In first stage, 31 provinces were selected, then, in second stage, 3 Shahrestan (subprovince) of each province based on size and distribution of population by probability proportional to size sampling were collected. Minimum (105) and maximum (777) samples are collected from Ilam and Tehran province, respectively. The women were selected randomly within each center and answered a self-report questionnaire with careful monitoring system [25]. SPSS 20 were used to analyze data. In this study, Kaplan-Meier estimate was applied as a useful survival analysis tool. The Kaplan-Meier method is used to analyze the time of events, such as death, marriage, and birth interval. [26-28]. The Kaplan-Meier method calculates according to the following formula and estimates for all "event times", t_i

$$S(t_i) = \prod_{i=1}^{i} \frac{n_i - d_i}{n_i} \qquad \text{Eq.1}$$

Where n is the number of individuals at risk at time t_i, and d_i is number of events at time t_i. These survival times (function) can be presented in a plot which can use for comparing them between two (or more) study groups. Although this is a simple method, but when the number of groups increases, there is not applicable method because it's complicated interpretation. In these circumstances using statistical test is more applicable. Log-Rank and Wilcoxon tests are the most useful tests for comparing survival time between groups. . For the two groups, Hypotheses are given as:

$$H_0: S_1(t) = S_2(t)$$
$$H_1: S_1(t) > S_2(t)$$

Where $S_i(t)$ is the survival function at time t_i.

In this article log-rank test was used as a nonparametric test that compares survival times between two (or more) groups at each event time. In this method observed and expected number of events is computed and compare with each other to test the null hypothesis. [29-31].

Results

Mean age of 6177 women respondents was 29.9 with the standard deviation of 6.06 years and mean age of marriage was 21.43 with the standard deviation of 4.68 years. In this article we consider place of residence, marriage duration, educational level, activity, number of ever born children and family income of women as covariates which can affects "ideal birth interval" that is response variable of 6177 women 15-49 years old. Table (1) shows frequency and percentage of covariates. About 72 percentages of women lived in urban areas and nearly 14 percentages of women were employed. Most of the respondents (34.1%) were past 5-9 marriage duration years. 85 percentages of women had 1 or 2 children, and only 1.3 percentages of women lived in a reach family (family income>=3 million IRR). Kaplan-Meier survival estimates are computed for women's ideal birth intervals and survival curve of those is shown in Fig (1). As this figure displays, most of the women's (about 80%) ideal birth interval were less than 5 years. Mean and median of Kaplan-Meier estimates were 4.3 and 4.0 respectively. The median equals to 4 means that half of the women prefer to have 4 years birth intervals between their children. Kaplan-Meier estimates, mean, median and 95% confidence interval for ideal birth interval between covariates are given in Table (2). These indicators help us to understand the average and median length of ideal birth intervals among various categories of covariates. The following results can be obtained from this table and Fig (2):

Women who lived in rural areas have greater mean (4.438) of preferred birth intervals than who lived in urban areas (4.277). So in average rural women preferred to space more between each

Table 1. Demographic and socio-economic characteristics of women 15-49 years old

Variable	Categories	Frequency	Percent
Place of Residence	Urban	4466	71.7
	Rural	1765	28.3
Marriage Duration	<=4	1879	30.2
	5-9	2123	34.1
	10-14	1324	21.2
	15-19	582	9.3
	20-24	222	3.6
	>=25	101	1.6
Educational level	Under secondary	1130	18.3
	High school & Diploma	3390	54.9
	Associate/BA/BS	1492	24.2
	Master/PhD & above	159	2.6
	Religious	6	0.1
Activity	Employed	845	13.7
	Unemployed	5332	86.3
Ever Born Children	0	12	0.2
	1-2	5252	85.0
	3-4	830	13.4
	>=5	83	1.3
Family Income	<=1 Million IRR	4428	71.7
	1-2 Million IRR	1345	21.8
	2-3 Million IRR	322	5.2
	>=3 Million IRR	82	1.3
Total		6177	100

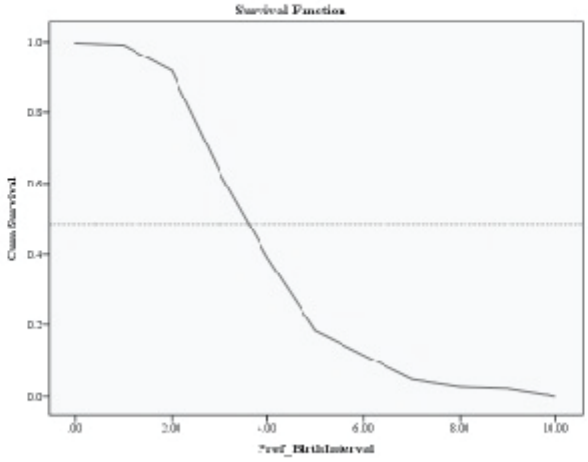

Fig. 1: Kaplan-Meier survival curve of ideal birth interval

Table 2. Kaplan-Meier estimates of ideal birth interval by covariate

Variable	Categories	Mean		Median		Log-Rank Test (*p*-value)
		Estimate	95% confidence interval	Estimate	95% confidence interval	
Place of Residence	Urban	4.277	(4.228, 4.326)	4.000	(3.941, 4.059)	11.107
	Rural	4.438	(4.356, 4.521)	4.000	(3.902, 4.098)	(0.001)
Marriage Duration	<=4	4.290	(4.210, 4.369)	4.000	(3.905, 4.095)	
	5-9	4.289	(4.218, 4.359)	4.000	(3.915, 4.085)	
	10-14	4.401	(4.309, 4.494)	4.000	(3.897, 4.103)	1.197
	15-19	4.337	(4.201, 4.473)	4.000	(3.829, 4.171)	(0.274)
	20-24	4.541	(4.304, 4.777)	4.000	(3.714, 4.286)	
	>=25	4.060	(3.796, 4.324)	4.000	(3.950, 4.050)	
Educational level	Under secondary	4.428	(4.324, 4.533)	4.000	(3.861, 4.139)	
	High school & Diploma	4.372	(4.313, 4.430)	4.000	(3.930, 4.070)	
	Associate/BA/BS	4.173	(4.094, 4.252)	4.000	(3.913, 4.087)	27.776
	Master/PhD & above	3.969	(3.739, 4.198)	4.000	(3.725, 4.275)	(<0.001)
	Religious	3.333	(2.364, 4.302)	3.000	(1.400, 4.600)	
Activity	Employed	4.129	(4.024, 4.234)	4.000	(3.877, 4.123)	13.962
	Unemployed	4.353	(4.307, 4.400)	4.000	(3.945, 4.055)	(<0.001)
Ever Born Children	0	3.833	(3.077, 4.590)	4.000	(3.265, 4.735)	
	1-2	4.342	(4.295, 4.388)	4.000	(3.946, 4.054)	4.894
	3-4	4.251	(4.140, 4.361)	4.000	(3.857, 4.143)	(0.027)
	>=5	3.916	(3.508, 4.323)	4.000	(3.619, 4.381)	
Family Income	<=1 Million IRR	4.352	(4.301, 4.402)	4.000	(3.939, 4.061)	
	1-2 Million IRR	4.257	(4.169, 4.346)	4.000	(3.895, 4.105)	4.402
	2-3 Million IRR	4.220	(4.036, 4.405)	4.000	(3.803, 4.197)	(0.036)
	>=3 Million IRR	4.220	(3.902, 4.537)	4.000	(3.644, 4.356)	
Total		4.323	(4.280,4.365)	4.000	(3.950,4.050)	

Child in compare with urban women. But the median of both groups is the same and equal to 4years. Fig (2.a) shows the survival curves of women's preferred birth intervals according to their resistance areas that displays differences between two curves. These differences are proved by Log-Rank test which is computed in Table (2) and significant at 0.01 level (*p*-value=.001). There is not obvious pattern which indicate the trend of ideal birth interval's means between marriage duration categories. The maximum and minimum ideal birth interval's mean is 4.541 and 4.060 which is belongs to 20-24 years and ≥25 years

marriage duration categories, respectively. The median of six marriage duration groups is the same and equal to 4 years. Regarding to the survival curves of Fig (2. b), ideal birth interval does not different between women's marriage duration. This result also confirmed by Log-Rank test that shows not statistical differences between survival curves among marriage duration (p-value=0.274).

Fig (2.c), showed that more than 80 percentage of women who have religious educational level, preferred to space 4 years interval between each child. Percent of 4 years ideal birth interval decreases to 70 and 60 percent among university educated (Associate/BA/BS, Master/PhD & above) and under diploma (Under secondary, High school & Diploma) women, respectively.

These variations also proved by very significant Log-Rank test (p-value <0.001). Median of ideal birth interval for religious educated women is 3 years which is one year less than median of preferred birth interval for other educational levels.

Unemployed women have greater mean (4.353) of ideal birth intervals than employed women (4.129). Fig (2.d) shows the survival curves of women's ideal birth intervals according to their activity that displays differences between two curves. These differences are proved by Log-Rank test which is computed in Table (2) and significant at 0.001 level (p-value<0.001).

Women who were childless or born more than 5 children ideal less birth interval mean (3.833, 3.916) than women who had 1 to 4 children (4.342, 4.251). Fig (2. e), showed that the timing of ideal birth intervals differed between women's children ever born. Log-Rank test also proved this differences (p-value=0.027). Pattern of average ideal birth interval is decreasing from law (4.352) to high (4.220) family incomes. Fig (2.f) displays the survival curves in each family income group. As this figure shows there are differences between curves pattern of each family income group. These variations also proved by significant Log-Rank test p-value (0.036).

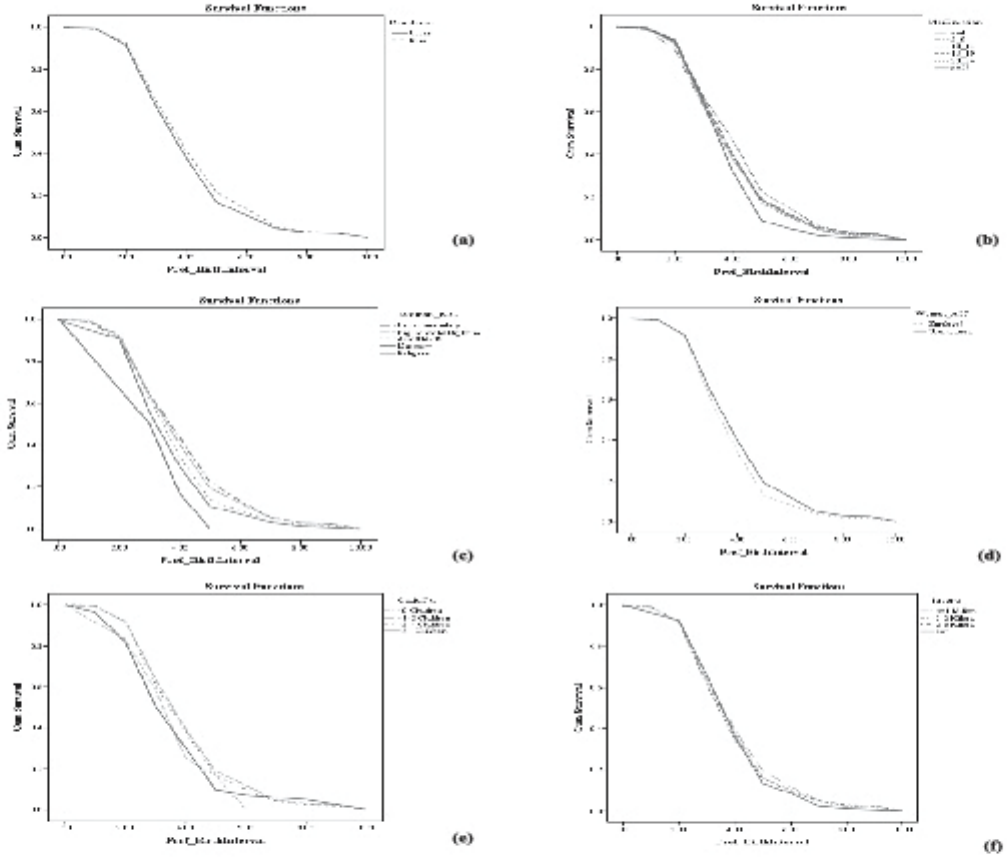

Fig. 2: Kaplan-Meier survival curve of ideal birth interval (pref-Birth Interval) by covariates

Discussion: Women's place of residence, education and job status as important socio-economic factors could affect on birth interval; the study in Korea showed that women with higher educational level had shorter second birth interval than ones with lower educational level [33]. These women may want to return to the situation before their childbearing such as their activity. On the other hand results of study included 51 DHS data showed that in 38 countries, lower educated women had shorter birth intervals than higher ones [34]. In other study included 55 countries rural, women in 51 countries had shorter birth interval than urban ones [34, 35]. Women's employment does not have clear effect on birth interval; the effect of activity type may be more important. Women with official and modern job had longer birth interval than women with other job types [34, 35]. Women's age is another influential factor for birth intervals. Older women have longer birth interval because they want to reach their ideal number of children and have less fertile duration [7, 34-35].

In developing countries, the desire to stop childbearing and lengthen birth intervals after couples reach their ideal family size are the provocation forces that drive the fertility transition [2]. There is not enough studies about ideal birth intervals in all over the world. So the aim of this study was to investigate the effect of selected factors on ideal birth interval among 15-49 year old women in Iran. To analyze ideal birth interval and factors which affect on its variability Kaplan-Meier survival estimates and Log-Rank test were used. Median and mean of ideal birth interval were 4 and 4.323 years, respectively which were in the recommended range [3, 5] years set by the Ministry of Health for Iran [2]. These values indicate that Iranian women in the fecund ability age aware about optimum birth interval. Based on previous studies, in developing countries median birth interval was about 32 months and in less developed countries for who breastfeed their infants was about 3 years [36]. Therefore, those women who had fewer ideal children had longer child birth intervals. In addition to different social and cultural norms in rural and urban areas such as better accessibility to health facilities in urban areas some other factors such as long exclusive breastfeeding in rural area lead to widens of birth interval [2]. Since higher educated women have more health knowledge compare to lower ones, they have longer birth intervals [9,16,37]. This study has demonstrated that women with higher educational level have shorter ideal birth intervals. Fallahzadeh et al, Al-Nahedh and Hemochandra et al. derived the same results [9]. Ramarao et al. (2006) had called the reason of short interval for highly educated women as 'compressing the child bearing'. In this study, employed women had shorter ideal birth interval in compared with unemployed ones. Women's activity had shown short interval in some of the countries [38]. On the other side, Mturi (1997) and Setty-Venugopal and Upadhyay (2002) had reported long interval for employed women [34, 35]. Based on this study woman with high income had larger ideal birth interval than low income women, this is the same as other studies [39].

Conclusions: Modeling fertility data is very important in health and demographic researches. Among factors which are affecting on fertility, birth interval is important one because of its effect on fertility rate, completed family size and maternal and child mortality [32]. There are many socio-economic factors such as women's place of residence, education and job status that may affect on birth interval, studying these influential factors was the main purpose of conducting this study. The results of the current study showed that, there are significant variations in preferred birth interval between different categories of woman's place of residence, educational level, activity, ever born children and family income. There was not a significant association between ideal birth interval and marriage duration.

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