

# Effect of education on age at first birth in Semnan, Hormozgan, Kohkiloye and Boor Ahmad provinces, Iran

Hajjieh Bibi Razeghi Nasrabad <sup>1</sup>

<sup>1</sup> Department of Family Studies, National Population & Comprehensive Management Institute, Tehran, Iran.

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## Original Article

### Abstract

**Introduction:** Iran experienced a dramatic fertility decline during recent decades. There was also an indication of a shift towards later childbearing from 2000. Past research on fertility has shown that the education variable is the most important determinant of fertility behaviors. However, the impact of education on fertility timing in Iran has been less considered.

**Methods:** In a cross sectional study 1149 ever-married women aged 35-44 in three provinces with different levels of fertility, Semnan, Hormozgan, Kohkiluyeh and Boor Ahmad, were selected by the multi-stage cluster sampling method. A structured questionnaire instrument was used for data collection. Kaplan-Meier estimates and Cox Regression were used to analyze data.

**Results:** Kaplan-Meier estimates in three province show significantly different between age at first birth and women's educational level ( $P < 0.05$ ). Mean of age at first birth among university educated women in Semnan, Hormozgan, and Kohkiluyeh and Boor Ahmad provinces was 23.5, 24.6 and 24.29 respectively. Results of the multivariate analysis using the Cox Proportional Hazard model show also that university education is a significant factor in reducing the risk a first birth in three provinces. However the decreasing impact on the risk of first birth in Semnan is lower than other provinces.

**Conclusion:** Women's access to education in Iran is a substantial contributor of postponement of childbearing and higher educated women are pioneers in delaying childbearing and reducing fertility in Iran.

**Key words:** Education, Postponement, Kaplan-Meier estimates, Cox Model, Iran

Correspondence:  
Hajjieh Bibi Razeghi  
Nasrabad, PhD.  
Department of Family Studies,  
National Population &  
Comprehensive Management  
Institute  
Tehran, Iran  
Tel: +98 9127137472  
Email:  
hajjieh.razeghi@gmail.com  
Orcid iD:  
0000-0002-0990-9689

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### Introduction:

Iran experienced a dramatic fertility decline during recent decades. The total fertility rate (TFR) decreased from 7.7 in 1966 to around 6.0 by the mid-1970s, rose slightly during the late 1970s and early 1980s, and fell sharply during the 1990s. The own- children estimates of fertility for Iran based on the 2006 Census show that the TFR had reached replacement-level (2.1) in 2000 and further declined to 1.9 by 2006 (1). Total fertility rate declined to 1.8 in 2011. Provincial levels of fertility indicate that in 2011 the total

fertility rate in 22 out of the 31 provinces of Iran is below replacement level (2).

One of the features of below replacement fertility level is increasing age at first birth which has occurred at the same time with rising women's marriage age. Decline in fertility in Iran has been attributed partly to the rising childbearing age.

During the last three decades little changes have taken place in the timing of the first birth in Iran. According to Hosseini Chavoshi et al (3) in 1976, the highest age-specific fertility rate

occurred in age group 20-24, but during the first half of the 1980s, this rate is related to age group 25-29. Use of contraception within the first birth interval also increased from 3 to 20 percent (4).

A short delayed motherhood from 1990 onwards in Iran has been also reported by Abbasi Shavazi and Razeghi Nasrabad (5). They found that in the early 2000s the median survival time was 2.7 year and more than 90 percent of women had first birth within 5 years of their marriage. According to 2011 DHS data the share of women who postpone childbearing to later time has increased. McDonald and et al (6) estimated first birth timing in Iran using the synthetic parity progression ratios. The synthetic parity progression ratios for a lifetime of ten years indicate that the median survival time increased and reached to 3.5 year in 2011.

Changes in the timing of the first birth have impacts on both the timing and number of subsequent births. A vast literature documents the negative relationship between first birth timing and completed fertility (7, 8). Increase at age at first birth, eventually reduce total population size. In general, each increase in age at birth leads to a one-time decrease of births by an amount proportional to the change in mean age (7).

In recent years, in response to the rapid decline in fertility rates over the past two decades in Iran, demographic policies have shifted towards population increase (9). In this regard, several studies have been conducted so far to explain the decline in fertility rate. While a later start of childbearing is a prominent feature of recent fertility trends in Iran, a clear explanation for this change is still lacking. We provide here new evidence on the role of increased education on delay fertility.

The effect of education on fertility timing is diverse in different societies. The rise in women's access to education is often cited as a possible cause of the trend to later childbearing in developed societies. The evidences (10-13) suggest that literate women are getting married later, their first child is born later and gives birth to fewer children.

Neels and De Wachter (14) found that the rise in educational attainment explain differences in fertility timing. Beets et al. (15) found that highly

educated women were the 'forerunners' of this process in European countries, and estimated that the increasing education level explains about half of the increase in the mean age at first birth among Dutch women born between 1931-1940 and 1961-1965.

By contrast, Rindfuss et al. (16) Rendall et al. (17) did not support the proposition that rising educational attainment explains the trend to later childbearing. Tropic and Mandemakers (18) found that in United Kingdom only 1.9 months of the 2.74 years of fertility postponement for birth cohorts 1944-1967 could be attributed to educational expansion. They conclude that the rise in educational attainment alone cannot explain differences in fertility timing between cohorts.

In recent years, the status of women in Iran has also improved relatively. According to the results of the census (19) in 1956 only 8 percent of females (aged 6 or higher) were literate, it raised slightly since 1966, reaching around 35.5 percent in 1976, it raised rapidly therefore to reach 81.1 percent in 2011, (85.6% in urban and 69.4% in rural areas). More important, girls' share to enter universities has increased and in 2016 about 64% of them were girl.

However, the impact of education on fertility timing in Iran has been less considered. The main question is how does education has contributed to childbearing timing in Iran. Does the impact of university education on fertility timing in women who come from provinces where delay is not widely accepted in cultural terms and fertility levels are also at or above the replacement level is similar to those who live in more developed regions and lower fertility levels?

Using survival analysis we estimate mean age at first birth among women in Hormozgan, Kohkiloye and Booir Ahmad and Semnan provinces. Understanding of the causal relationship between age at first birth and female education in a community where relative marriage and childbearing have high normative value is particularly important (5) and will help to expand knowledge about changes in reproductive behaviors and social and cultural changes. In addition to, a further delay in childbearing means more demand for family

planning services, so the results are important for health policy making and practice.

### Methods:

The data for the present study is selected from a cross-sectional survey entitled as the, "Gap between Ideal and Actual fertility in Semnan, Hormozgan, Kohkiluyeh and Booir Ahmad Provinces in Iran" (20). Data for this study has been collected by a structured questionnaire in 2013. The statistical population covered ever-married women aged 35-44 belonging to one of the household's resident in three provinces with different levels of fertility. Hormozgan with a TFR of 2.5 was in the category of above replacement fertility, Kohkiluye and Booir Ahmad province with a TFR of 2.1 selected as replacement fertility, Semnan province with a TFR of 1.4 selected as Below-replacement fertility.

In addition to the differences in the fertility level, in other characteristics of modernization, the difference between these three provinces is significant. According to the results of the census in 2016 (19). Semnan province has the highest rate of female literacy (91%) and urbanization (77%) in the country. Urbanization rate in Hormozgan and Kohkiloye and Booir Ahmad provinces was 47.1% and 47.6%, respectively.

In addition to, based on findings of Biranvandzadeh et al (22) on social-economic development, the second rank belonged to Semnan province. Hormozgan and Kohkiloye and Booir Ahmad provinces are classified as less developed provinces (28<sup>th</sup> and 29<sup>th</sup> rank among the 30 provinces). So in this article, we can examine the impact of education on fertility timing in different socio-demographic conditions.

A combination of sampling techniques including multistage clustering and systematic random sampling were employed. The study covered around 400 households in each province. However, the information regarding the age at first birth was obtained for 1149 ever-married women aged 35-44.

The dependent variable in this study is the age at first birth which is measured in completed years. The starting time for this variable is 13 years which may be interpreted as the time that women started experiencing a first birth. Education level is the main independent variable of this study. It is measured by level of education

attained by a woman by an ordinal question with four categories including, Illiterate and Primary education, Secondary education, High school education, and university education. We use Kaplan-Meier techniques to estimate age at first birth. The Kaplan-Meier method estimates for all "event times",  $t_i$ , and can be calculated according to Formula (1):

$$S(t_i) = \prod_{i=1}^i \frac{n_i - d_i}{n_i} \quad (1)$$

Where  $n$  is the number of individuals at risk at time  $t_i$ , and  $d_i$  is number of events at time  $t_i$ .

Because the age at first birth depends on many factors, it is analytically useful to apply multivariate analysis that here the hazard regression model (22) is used. In multivariate model "education level, employment status, place of residence, place of birth and consanguinity" were considered as socio-economic factors, which can affect on risk the first birth. This model determines how education level influences the risk of a first birth when we control the effect of other covariates. The instantaneous risk of first birth at time  $t$  due to the hazard regression function is given by:

$$h_i(t) = [h_0(t)]e^{b \cdot x} \quad (2)$$

Where  $h_i(t)$  is the instantaneous risk of having a first birth at time  $t$  (given that there is no prior birth for a female with a vector of covariates  $x$ ),  $h_0(t)$  is an arbitrary non-negative unspecified baseline hazard function not dependent on the covariates, and  $b$  is a vector of unknown regression coefficient to be estimated. The exponentiated value of the regression coefficient,  $e^{b \cdot x}$ , represents the relative risk of other groups in relation to specified baseline groups.  $e^{b \cdot x}$  equal one unity when no covariate is present, with values greater (or less) than one indicating the relative risk of having a first birth is greater (or less) for this group than that of the reference group. Hazard regression model for age at first-birth in was investigated in SPSS software (version 17). P-value less than 0.05 were considered statistically significant.

### Results:

The analyses begin with comparisons of the age patterns of first childbearing across all women in each of the three provinces by

education level. This result is shown in table 1. The mean of age at first birth of illiterate and primary women in Semnan Province is 19.14 years. Women with secondary and high school education had mean age at first birth of about 20.54 and 21.73 years, respectively. While those with university education level, have a mean age at first birth of 23.50 years. In Kohkiloye and Booir Ahmad, the mean age at first birth of illiterate and primary is 17.14 years, it increased to 24.91 years in women with university

education. In Hormozgan, the mean age at first birth of illiterate is 20.92 years, it increased to 24.67 years in women with university education. These results show that a higher level of education is associated with higher age at first birth. As can be seen, the difference in age at first birth based on the level of education in Semnan province is lower than the other two provinces. As a result, it seems that the effect of education on fertility timing in lower fertility regimens and developed regions is lower than other regions.

**Table 1. Kaplan-Meier estimates of age at first birth by woman's educational level in Semnan, Hormozgan, Kohkiloye and Booir Ahmad Provinces in Iran**

Province	Women's educational level	Mean		Median		Log-Rank test	
		Estimate	Std.error	Estimate	Std.error	Estimate	Std.error
Semnan	Illiterate and primary	19.143	1.908	18.000	1.309	38.734	0.000
	Secondary	20.548	.461	19.000	.572		
	High school	21.731	.510	21.000	.576		
	University	23.503	.335	23.000	.325		
	Total	22.107	.253	22.000	.231		
Hormozgan	Illiterate and primary	20.927	1.141	19.000	1.596	21.535	0.000
	Secondary	20.778	.485	20.000	.771		
	High school	21.842	.503	21.000	.529		
	University	24.677	.555	25.000	.677		
	Total	22.173	.304	22.000	.332		
Kohkiloye and Booir Ahmad	Illiterate and primary	17.211	.690	17.000	.876	55.133	0.000
	Secondary	18.411	.328	18.000	.367		
	High school	20.119	.496	19.000	.752		
	University	24.291	.771	25.000	1.346		
	Total	19.672	.723	19.000	.357		

**Table 2. Results from hazard regression model for age at first-birth in Semnan, Hormozgan, Kohkiloye and Booir Ahmad Provinces**

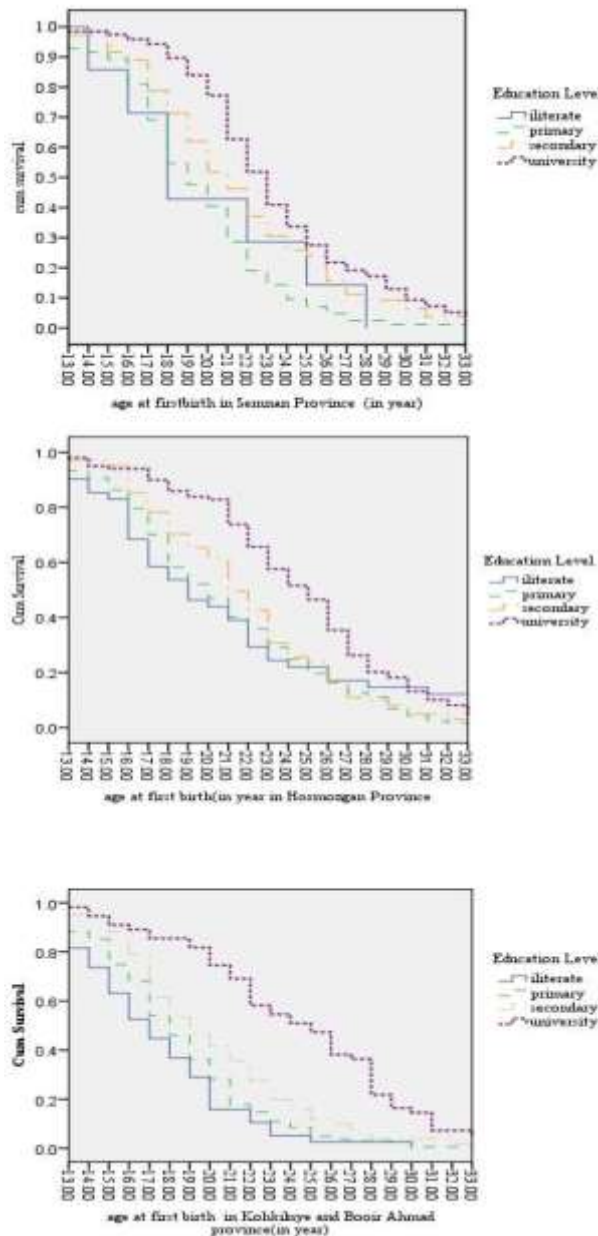
Variable	Semnan				Hormozgan				Kohkiloye and Booir Ahmad			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
	Sig	Exp(B)	Sig	Exp(B)	Sig	Exp(B)	Sig	Exp(B)	Sig	Exp(B)	Sig	Exp(B)
Education (Ref: university)												
Illiterate and Primary	.000	2.114	.000	1.718	.000	1.783	.001	1.788	.000	3.374	.000	3.208
Secondary	.046	1.763	.006	1.592	.047	1.456	.008	1.341	.000	2.664	.000	2.575
High school	.047	1.272	.072	1.293	.002	1.543	.016	1.466	.000	1.868	.002	1.820
Employment status(ref: employed)												
unemployed			.150	.793			.202	.777			.815	.952
Place of residence (Ref: rural)												
Urban			.513	1.105			.046	.792			.459	1.103
Place of birth (Ref: rural)												
Urban			.208	1.177			.070	1.277			.669	.932
consanguinity conscious			.223	1.141			.019	1.364			.153	1.181
-2 Log Likelihood	3938.784	3933.346	3533.452	3526.584	3494.181	3479.473						
Chi-square	33.450	38.777	18.695	25.373	47.193	49.834						

Sig: Significance level

The Figure 1 show Kaplan-Meier Survival Plot of age at First Birth by Education Level in Semnan, Hormozgan, Kohkiloye and Booir

Ahmad Provinces. Pattern of the survival curves showed that by increasing women's educational level, age at first birth also increased. These

variations also proved by significant Log-Rank test P-value ( $P < 0.05$ ). University educated women had the largest age at first birth timing comparing the other educational levels.



**Figure 1. Kaplan-Meier Survival Plot of age at First Birth by Education Level in Semnan, Hormozgan and Kohkiluyeh and Boer Ahmad Provinces**

For multivariate analyses, we applied Cox Regression. In multivariable analysis, two models were used for analysis of the risk of bearing the first child. Model 1 estimates the effects of

education level on the risk of the first child. Model 2 is obtained from adding other variable to Model 1 and examine the net effect of education in the presence other variable.

The results for these models are represented in Table 2. As for female's education, the results are in the expected direction. In three provinces, it has been found that educational level has a significant effect on the risk of bearing a first birth. A higher educational attainment generally reduces the probability of first birth.

In second model also education level has a significant effect on the risk of first birth in three provinces. In Semnan province, women with primary and less and secondary education level were at a higher risk of experiencing a first birth compared to other educational levels, but differences between the risks of first birth of women with high school level with university level (reference group) are not statistically significant. In this province other factors don't have significant effect on the risk of first birth.

The result of analysing the effect of education on risk of a first birth in Hormozgan province imply that women with all education level were at a higher risk of experiencing a first birth compared to university levels. In this province place of residence and consanguinity have also a significant effect on the risk of a first birth. We conclude that the rise in educational attainment alone cannot explain differences on risk of a first birth Hormozgan province.

In Kohkiluyeh and Boer Ahmad province, women's education level was the only significant factor on the risk of a first birth. In this province, the decreasing impact of university education on the risk of first birth is stronger than another province.

### Conclusion:

The main objective of the study was to investigate influence of education on age at first birth. The statistical population covered ever-married women aged 35-45 belonging to one of the household's resident in three provinces Semnan, Kohkiluyeh and Boer Ahmad and Hormozgan. The study employed the Kaplan-Meier estimates for the bivariate analysis and Cox regression for the multivariate analysis.

Findings show in Semnan province with below replacement fertility, Kohkiluyeh and Boer

Ahmad with replacement fertility and in Hormozgan with above replacement fertility, women had the mean of women age in first birth of 22.10, 19.67, and, 22.17 years respectively. The findings are different from the results of many European countries that characterised by both low overall fertility and high age at first birth. The average of the 28 European Union countries was 28.9 in 2014 (23). High age at first birth in Europe is suggested the negative relationships between completed cohort fertility and postponement of first birth for many European countries (24). As a result it seems that the age at the first birth in all fertility levels in Iran is lower than in many countries where fertility is below substitution levels. These results confirmed that there are strong norms or pressures for parenting in Iran. Although fertility declined to low level, there was short delay of the first birth in Iran. Having a child is a key goal for Iranian families; they wanted to have children not only to fulfill their personal desires, but also because of religious and cultural norms and values. This result is consistent with the findings of other studies (25).

The findings are different from the results of the Malaki Moghadam and Miri (26). They examine mean age of first birth on 180 couples from Birjand city who were married in 2011. Their result showed the mean age of the mother at the time of birth of the first child in Birjand city was 24.72. This study focused only on the recent marriage cohort in the urban area. Based on this finding, it can be said that the recent marriages in urban areas experience more delays in childbearing.

The key finding of this study is a significant difference in the mean age at the first at different educational levels. The results of the Kaplan-Meier estimates of age at first birth by woman's educational level indicated that women with university education level had higher mean of age at first birth compared to other education level. Results of the multivariate analysis using the Cox Proportional Hazard model showed also that the relative risk of first birth for the illiterate and primary, secondary, and high school were greater than women with university education. Even after entering the other variables into the Cox Proportional Hazard model, education was

identified as a major factor affecting the age at the first birth.

Base on the result, education is as the strongest determinant at first birth timing in Iran. Findings shown women who graduated from high school and university had a lower hazard of bearing the first child than illiterate women and those who graduated from primary and secondary school. Hence, by increasing the educational attainment, this risk can be significantly reduced. This result is consistent with the findings of Uunk and et al (27) Stier and Dotan (28) James and et al (29). There are several, potentially congruent, explanations for why more education is associated with postponement of first birth.

An explanation for this may be that higher education has raised women's aspiration for paid work. Educated women use from college for economic gain and consequently limit fertility. The incompatibility of education and employment with motherhood is shown in past research in Iran, (30, 31). While less-educated women have particularly poor labor market prospects and consider motherhood to their personal fulfillment they are more relative risk of bearing the first child. Similar results have been reported by Abbasi Shavazi et al (4, 5) and Saadati et al (32).

Furthermore, education may influence contraceptive knowledge and use. Fertility in Iran had declined since the mid-1980s before the revival of the family planning program in the late 1980s. Over a period of five years only the contraceptive prevalence rate increased from a rate of 27 percent to around 50 per cent by the mid-1990s. According to Abbasi Shavazi and *et al* (1) use of contraception within the first birth interval also increased from 3 to 20 per cent. The level of education is also strongly associated with first contraception. Woman education results in long year in school or university with increase in knowledge so that they can choose the most effective method of contraception and its correct use. Hosseini Chavoshi *et al* show that (3) illiterate women were less likely to adopt contraception before their first pregnancy and only 2.2 percent of them used contraception within the first year after marriage before the first pregnancy. While using contraception in the first

year of marriage was most common for higher educated women and this proportion for women with diploma or university-level education was 45.5 percent.

However, findings show that decreasing impact of university education on the risk of first birth in Semnan is lower than another province. The mean of age at first birth among better educated women in Semnan, Hormozgan, Kohkiloye and Boor Ahmad provinces was 23.5, 24.6 and 24.29 respectively. The stronger impact of university education on reducing the relative risk of first birth in women from less developed regions is an important finding for the literature on education and fertility in Iran. This result is consistent with the findings of other studies. A qualitative study (31) on educated college women showed that many women were reluctant to delay due to fear of infertility and high-risk pregnancies, after they had received enough money for child care and their husbands collaborated in housework. Brand and Davis (33) found that the fertility decreasing college effect is concentrated among women from comparatively disadvantaged social backgrounds. From Brand and Davis point of view educated women with disadvantaged social backgrounds may perceive and encounter high role incompatibility between job with family obligations, while educated women with advantaged social backgrounds are more likely to have a sense of personal efficacy, egalitarian gender role attitudes, employers willing to adjust to their family needs, and husbands who make good money for child care help them in their home affairs. Such financial and social resources translate into domestic assistance and childcare, making it possible to have children with less concern for combine a job with family obligations.

However, our findings support our assumption that education leads to later motherhood. Higher age among highly educated women suggest that higher educated women are pioneers in delaying childbearing and reducing fertility in Iran. Therefore due to the more access of women to education and broader opportunities for their paid employment at the future, female participation in the labour force will increase which in turn can lead to more delay of the first birth.

The results of the present study not only deepen our understanding about differentials in age at first birth and the impact of female education on fertility, but also provide important information for policy makers who are aimed at increasing fertility. Given the high incompatibility between education and employment with motherhood in Iran and in order to prevent further increase in maternity age, we propose facilitating conditions for combining job with family obligations.

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#### Conflict of interest statement:

The author declares that there is no conflict of interest.

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## بررسی تأثیر تحصیلات بر سن مادر در زمان تولد اولین فرزند در استان‌های سمنان، هرمزگان، کهگیلویه و بویراحمد

حجیه بی بی رازقی نصرآباد<sup>۱</sup>

<sup>۱</sup> گروه مطالعات خانواده، مؤسسه مطالعات و مدیریت جامع و تخصصی جمعیت ملی، تهران، ایران.

مجله پزشکی هرمزگان سال بیست و دوم شماره اول ۹۷ صفحات ۱۱۲-۱۰۳

### چکیده

**مقدمه:** نرخ باروری کل در ایران در سه دهه اخیر کاهش قابل توجهی داشته است. همچنین تغییرات به سمت تأخیر فرزندآوری از سال ۱۳۷۹ رخ داده است. تحقیقات پیشین نشان دادند که متغیر تحصیلات مهمترین تعیین کننده رفتار باروری است، اما تأثیر آن روی زمان فرزندآوری کمتر بررسی شده است.

**روش کار:** داده‌ها برای این مطالعه از طریق پرسشنامه محقق ساخته در میان ۱۱۴۹ زن ازدواج کرده ۲۴-۲۵ ساله در سه استان با نرخ باروری و سطح توسعه یافتگی متفاوت شامل سمنان، کهگیلویه و بویراحمد و هرمزگان، در سال ۱۳۹۲ جمع‌آوری شده است. برای برآورد میانگین سن در اولین تولد بر حسب سطح تحصیلات، تکنیک کاپلان مایر به کار رفته است. همچنین برای شناسایی تأثیر تحصیلات بر ریسک نسبی اولین تولد از رگرسیون کاکس استفاده شده است.

**نتایج:** نتایج آزمون کاپلان مایر نشان داد در هر سه استان تفاوت معنی‌داری بین سن در اولین تولد و سطح تحصیلات زنان وجود دارد ( $P < 0.05$ ). میانگین سن در اولین تولد در زنان با تحصیلات دانشگاهی در استانهای سمنان، هرمزگان، و کهگیلویه و بویراحمد به ترتیب ۲۳/۵، ۲۴/۶ و ۲۴/۲۹ بود. نتایج تحلیل چند متغیره با استفاده از مدل مخاطره متناسب نشان داد که تحصیلات دانشگاهی یک عامل موثری در کاهش ریسک تولد فرزند اول در هر سه استان می‌باشد، اما تأثیر کاهشی آن در استان سمنان کمتر از دو استان دیگر است. زنان با تحصیلات دانشگاهی میانگین سن بالاتری در مقایسه با همه سطوح تحصیلی دیگر دارند. تحلیل رگرسیون کاکس نشان می‌دهد تحصیلات حتی در حضور متغیرهایی نظیر وضعیت اشتغال، محل سکونت، محل تولد و ازدواج خویشاوندی، عامل مهمی در کاهش ریسک نسبی تولد اولین فرزند می‌باشد.

**نتیجه‌گیری:** مبتنی بر نتایج مطالعه دسترسی زنان به تحصیلات در ایران، یک عامل اصلی در تأخیر در تشکیل خانواده و فرزندآوری است و زنان با تحصیلات دانشگاهی پیشگام تأخیر در فرزندآوری و کاهش باروری هستند.

**کلیدواژه‌ها:** تحصیلات، تأخیر، کاپلان مایر، رگرسیون کاکس، ایران

نویسنده مسئول:

دکتر حجیه بی بی رازقی نصرآباد  
گروه مطالعات خانواده، مؤسسه و  
مدیریت جامع و تخصصی جمعیت ملی  
تهران-ایران

تلفن: +۹۸ ۹۱۲۷۱۳۷۴۷۲

پست الکترونیکی:

hajjiteh.razeghi@gmail.com

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