

Original Article

Determinants of Iranian childless divorced women's first marriage survival: a cross-sectional analysis

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Abstract

Background: Identifying the underlying factors contributing to the marriage survivals of childless divorced women can help increase possibility of childbearing and consequently raise of fertility rates. The aim of the present study is to investigate the factors influencing First Marriages Survival (FMS).

Methods: In this study, FMS of 469 divorced childless women through a secondary data analysis of a cross-sectional divorce survey conducted by the National Organization for Civil Registration in 2017-2018, were analyzed. Through, selecting the most significant determinants of FMS by non-parametric random survival forest (RSF), the ideterminants of FMS were identified using unshared frailty parametric survival models, utilizing Stata and R software.

Results: Adopting policies aimed at providing employment opportunities with higher job security for educated women, reducing the marriage age, and focusing on emotional divorce to enhance the stability of marriages among childless women is essential.

Conclusion: Adopting policies aimed at providing employment opportunities with higher job security for educated women, reducing the marriage age, and focusing on emotional divorce to enhance the stability of marriages among childless women is essential.

Keywords: First marriage survival; Non-parametric survival forest approach; Parametric survival models; Unshared frailty accelerated failure time models.

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Introduction

The Industrial Revolution emerged in the second half of the 18th century with fundamental and rapid changes in technological structure in England. Gradually spreading to other parts of the world, it became the source of the most significant transformations in human society and the formation of industrial society. This revolution brought about changes in the family sphere by transforming the extended family into the nuclear family, shifting marriage from

arranged, economic, and pragmatic forms to love-based unions, and causing extensive changes in the roles of women (1).

Socio-economic development, along with its benefits, has brought about numerous challenges within the family. Changes in lifestyle and social relationships have led to the emergence of new perspectives, subsequently giving rise to phenomena and issues such as divorce. With increasing levels of development, due to the rising number of women in the workforce and

higher levels of education, more and more individuals worldwide are financially capable of affording divorce. They possess the skills, knowledge, and resources necessary to support themselves outside of marriage, ultimately leading to an increase in divorce rates (2-4).

According to a United Nations report (2018), in recent years, the divorce rate has significantly increased not only in developed countries such as USA (2.9 divorces per 1,000 people) and Russia (4.7 divorces per 1,000 people) but also in developing countries like Egypt and Jordan (2.1 divorces per 1,000 people) (5). In Iran, development programs, influenced by modernization models, have led to functional disruptions in the social system due to the impact of natural conditions, human and structural factors, and a one-sided and unbalanced emphasis on economic growth while neglecting other aspects of development. This has resulted in the emergence and spread of social issues such as marriage and divorce. According to the latest statistics released by the National Organization for Civil Registration, the number of marriages in 2023 (524,139 cases) decreased by approximately 6% (31,505 cases) compared to 2019 (555,644 cases). Meanwhile, the number of divorces increased by 24,829 cases, reaching 204,301 cases in 2022, marking the highest divorce rate in the past decade (6).

Since below replacement fertility rate is one of the most important challenges in recent decade in Iran, studying marriage and divorce events provide a pathway to better understand women's fertility behavior. In general, numerous factors contribute to the failure or survival of a marital relationship, and researchers have approached this issue from various perspectives. Some have considered individual, familial, social, and economic factors, while others have emphasized the ethnic and cultural backgrounds of couples as influential elements in these phenomena (7). Among

these factors, the following can be highlighted: lack of moral compatibility, addiction, psychological issues, interference from family and others (8), interference from in-laws (9, 10), women's employment (11, 12), remarriage (13,14), inability to resolve conflicts, sexual relations, and religious orientation (15-17), homogamy or heterogamy (18), educational disparities between spouses, women's education (7, 11, 19), marriage age (8), emotional divorce (20), the presence or absence of children (21), women's education a history of divorce in the family (9, 22), and leisure activities (16).

Although many studies considered divorce as a research subject, on one hand, the number of studies aimed at modeling marital survival (the duration of marital life) is very limited (7, 23). On the other hand, given the large number of predictor variables studied, in analyzing big data,

classical survival analysis methods (such as semi-parametric and parametric survival analysis), don't lead to efficient results. In this condition, there is a need to use developed survival analysis methods. Considering the significant role of women in the family and society, the feminization of the divorce structure in the country, their greater vulnerability to the consequences of divorce, and the critical impact on fertility rate changes, the present study aims to investigate the most important determinants of the survival of first marriages among childless divorced women, using a non-parametric approach of survival forests and frailty parametric survival analysis based on the conceptual model in Diagram (1).

Methods

This study is a secondary analysis of data from the first wave of the Marriage and Divorce Survey (a cross sectional survey) conducted by the National Organization for Civil Registration from autumn 2017 to autumn 2018. In this survey, the statistical population consists of men and women who

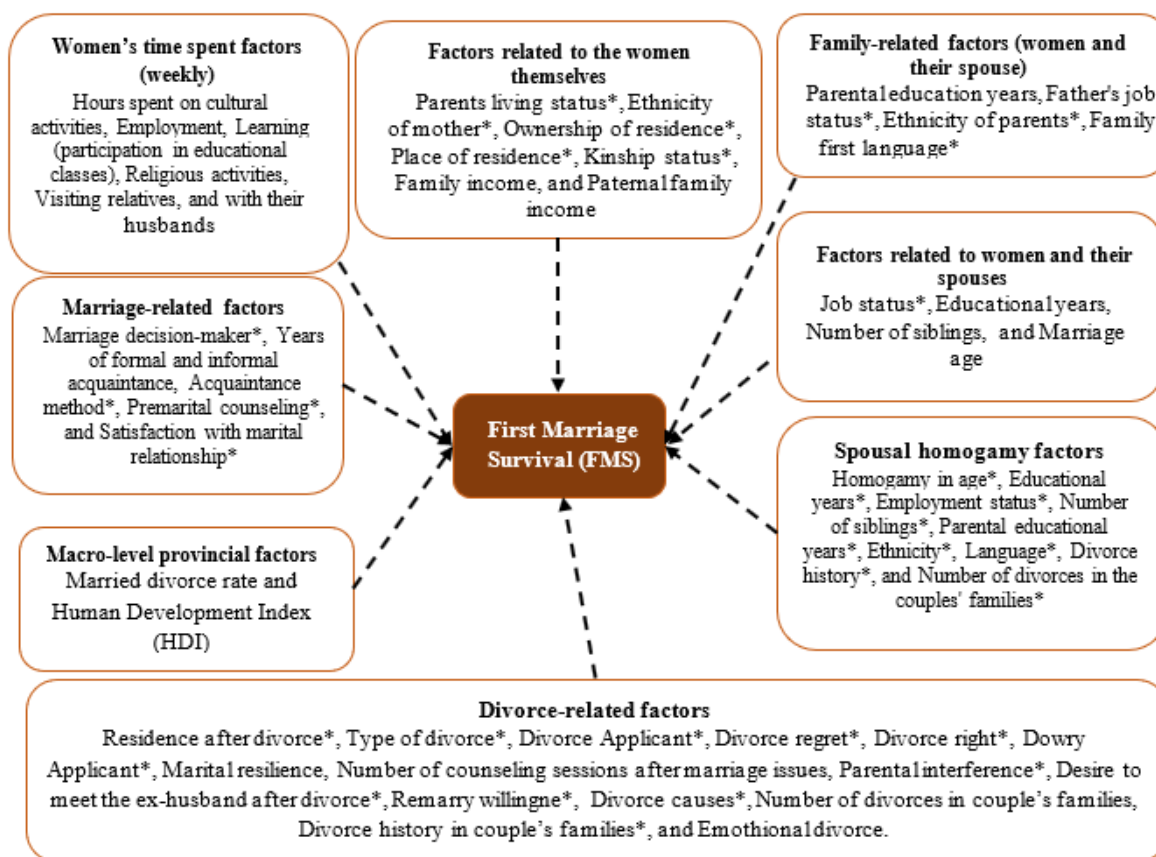


Diagram 1: Conceptual Model of Factors Affecting the First Marriage Survival (FMS) of Childless Divorced Women (quantitative* and qualitative predictors)

had visited the civil registration offices in provincial centers to register their divorce as part of the “Marriage and Divorce Survey” (24). The samples were selected using a quota sampling method proportional to the number of marriages and divorces registered in provincial centers in 2016, with a 99% confidence level, and the data were collected using a structured questionnaire. Additionally, in this study, a supplementary questionnaire was used to gather information about the respondent's spouse in case of their absence, which was then completed by the spouse. Questionnaires were filled with the participants' satisfaction and written consent was obtained from the participants in this study and since no medical intervention was involved, the study did not require an ethic code.

In this study, given the subject under investigation, the Divorce Survey

Questionnaire, consisting of 72 questions across 8 sections, was used. Out of the 3,964 completed questionnaires in the divorce survey, 2,019 (50.93%) were from women and 1,945 (49.07%) were from men. Among the 2,019 questionnaires completed by women, 186 were filled out solely by women, with no available data on their spouses. These cases were excluded from the current study. Since the objective of this study was to examine the factors influencing the survival of first marriages among divorced women (including predictors related to their spouses), 1,833 questionnaires from women were used. Of these, 1,046 were completed by both spouses, while 787 had supplementary information: 651 questionnaires where wives provided additional details about their husbands and 136 where husbands provided information about their wives. Given that the supplementary questionnaire

contained fewer questions, only 1,697 of the women's completed questionnaires were suitable for analysis (1,046 completed by both spouses and 651 where wives provided supplementary data about their husbands). From these, 1,504 questionnaires pertained to women in their first marriage.

In the present study, 469 questionnaires from divorced women with no children, out of 1504 questionnaires from women who divorced in their first marriages, were analyzed to identify the main determinants of their marriage's survival. The analysis utilized non-parametric survival forest methods based on predictors shown in Diagram (1), which include factors related to their families, women themselves, women's time spent (weekly), women and their spouses, marriage, divorce, spousal homogamy, and macro-level provincial. Furthermore, to examine the simultaneous effect of the selected predictors on the *FMS* for these women, frailty parametric survival models were fitted to data using Stata, SAS, and R software packages.

Random forests are ensemble tree models introduced by Breiman (2001) with widespread application in machine learning algorithms and statistics. The initial applications of random forests were focused on classification and regression problems (25). Survival random forests were introduced as an extension of random forests to handle survival data with right-censoring. The construction of these forests follows the core components of random forests, including growing survival trees using bootstrap data, randomly selecting input features when tree nodes are split, deep tree growth, and calculating a group survival forest through averaging survival predictions (26). *RSF* algorithms described by Ishwaran and Kogler (2008) (27) as follows:

1. A number of bootstrap samples, m try, are randomly selected from the original data (n tree), and $m = \sqrt{p}$ predictor variables from a set of P

predictors are chosen as candidates for splitting each node into two child sub-nodes. A survival tree is grown for each bootstrap data set created by resampling (bagging) the data.

2. At each node h , the impurity index, based on the logarithmic rank statistic, for the child nodes α and β is calculated based on all possible splits for all the selected predictors at each node.
3. The predictors that have the highest significance of the logarithmic rank statistic, calculated from one of the child nodes resulting from the splits, are selected. The two child nodes are then created based on the values of predictors that resulted in the highest impurity statistic.
4. Steps 2 and 3 are repeated by considering each child node as a root node and performing the process recursively.
5. The tree is grown to its maximum depth without pruning, and the terminal node is defined as the node containing fewer than d_0 unique observed events, where $d_0 > 0$ (28).

Various algorithms for survival random forests exist, where the splitting rules such as rank-logarithmic splitting (*RSF1*), rank-score-logarithmic splitting (*RSF2*), splitting based on the Breyer score gradient (*RSF3*) and Conditional Inference Forest (*CIF*) (28-31) are used to construct the trees in the forest as follows:

***RSF1* splitting rule** (28, 30): To evaluate the log-rank split, let h be defined as the node of the tree to be split. Without loss of generality, h can be considered the root node (top of the tree). Assume the data can be represented as $(U_1, X_1, \delta_1), \dots, (U_n, X_n, \delta_n)$, where:

- X_i is the i -th predictor variable (feature vector),

- U_i is the observed time for the i -th observation,
- δ_i is the censoring indicator for the i -th observation.

If X is a specific variable (a coordinate of the feature vector X), a candidate split using these variable partitions node h into left (L) and right (R) daughter nodes based on the condition $X \leq c$ and $X > c$, respectively. (For simplicity, assume this variable follows a normal distribution).

Let $U_1 < U_2 < \dots < U_m$ be the distinct event (or death) times, and let:

- $d_{j,L}$ and $d_{j,R}$ be the number of events in L and R at time u_j ,
- $Y_{j,L}$ and $Y_{j,R}$ be the number of at-risk individuals in L and R at time u_j .

$$Y_{j,L} = \#(U_i \geq u_j, X_i \leq c), \quad (1)$$

$$Y_{j,R} = \#(U_i \geq u_j, X_i > c)$$

If $Y_j = Y_{j,L} + Y_{j,R}$ and $d_j = d_{j,L} + d_{j,R}$, the log-rank split statistic for the partition $L = \{X_i \leq c\}$ and $R = \{X_i > c\}$ is defined as:

$$L(X, c) = \frac{\sum_{j=1}^m (d_{j,L} - Y_{j,L} \frac{d_j}{Y_j})}{\sqrt{\sum_{j=1}^m \frac{Y_{j,L}}{Y_j} (1 - \frac{Y_{j,L}}{Y_j}) (\frac{Y_j - d_j}{Y_j - 1}) d_j}} \quad (2)$$

The absolute value $|L(X, c)|$ serves as a measure of split quality. A larger value indicates a greater survival difference between L and R , implying a better split. The optimal split is determined by finding the feature X^* and split point c^* such that: $|L(X^*, c^*)| \geq |L(X, c)|$.

RSF2 splitting rule (29-31): This method assigns scores to each survival time U_j based on the ordered predictor variable x (where $x_1 \geq x_2 \geq \dots \geq x_n$) and computes the log-rank scores $a_1, a_2, \dots, a_n$ as follows:

$$a_i = \delta_i - \sum_{j=1}^{\Gamma_i} \frac{\delta_j}{n - \Gamma_j + 1} \quad (3)$$

where $\Gamma_j = \#\{u: U_u \leq U_j\} = \sum_{i=1}^n 1_{U_i \leq U_j}$. For a given predictor variable x and a candidate split point c , the right daughter node ($x_i \leq c$) is evaluated using the sum of scores:

$$S_{n,c} = \sum_{i=1}^n 1_{x_i \leq c} \times a_i.$$

The expected value of this statistic is: $E[S_{n,c}] = m_c \times \bar{a}$ where $m_c = \sum_{i=1}^n 1_{x_i \leq c}$, $\bar{a} = \frac{1}{n} \sum_{i=1}^n a_i$. The variance is computed as:

$var[S_{n,c}] = \frac{m_c n_c}{n(n-1)} \sum_{i=1}^n (a_i - \bar{a})^2$, where $n_c = n - m_c$. The splitting criterion is defined by the standardized statistic:

$$L(x, c) = \frac{S_{n,c} E[S_{n,c}]}{\sqrt{var[S_{n,c}]}} \quad (4)$$

The optimal split c^* is chosen to maximize the absolute value of $L(x, c)$, ensuring the greatest survival difference between the two daughter nodes: $|L(n, c^*)| \geq |L(n, c)|$.

RSF3 splitting rule (31): The splitting rule based on the gradient of the Brier score is derived from Equation (4) and uses the node percentile of the Brier score as the splitting criterion.

Conditional Inference Forest (CIF) rule (29-31): This method utilizes a weighted Kaplan-Meier estimate based on all subjects from the training data at x for prediction. The way trees are aggregated in *CIF* is different from *RSF* approach. *CIF* put more weight on terminal nodes where there are a large number of subjects at risk. In contrast, *RSF* use equal weights on all terminal nodes. The *CIF* algorithm consists of the following steps (29):

1. For case weights w , the global null hypothesis of independence between any of the p covariates and the response variable is tested. if this hypothesis cannot be rejected, it will be stopped, otherwise the j th covariate X_j^* with strongest association to T is selected.

2. Select a set $A^* \subset X_j^*$ in order to split X_j^* into two disjoint sets. The weights w_α and w_β determine the two subgroups with $w_{\alpha,i} = w_{i|} (X_j^*, i \in A^*)$ and $w_{\beta,i} = w_{i|} (X_j^*, i \notin A^*)$ for all $i = 1, 2, \dots, n$.

3. Recursively steps (a) and (b) with modified case weights w_α and w_β , respectively is repeated.

The most commonly used performance evaluation indices for survival random forests include the Harrell's Concordance Index (C-index), which allows for the assessment of prediction error (PE) through this index (32); the Brier score (BS(u)), which is an alternative method to classic model selection techniques such as *AIC/BIC* in survival analysis (27); the Breiman-Cutler variable importance, which is obtained by randomizing the values of that variable for out-of-bag samples in a tree, sending the randomized out-of-bag sample down the tree, and determining the prediction error for the out-of-bag sample values (25); and the minimum depth, which evaluates the predictive performance of a variable by its depth or distance from the root node in the tree (33).

When the aim of the study is to describe the data and compare survival functions between two or more groups, non-parametric methods are appropriate. However, these methods are not suitable for examining the simultaneous effects of multiple predictor variables on the time of an event (or survival time). In such cases, the Cox Proportional Hazards (CPH) model, where the hazard of the event is modeled without the need to assume a specific distribution for the event time (semi-parametric model), or parametric survival models can be used. To fit the CPH model, the proportional hazards assumption (PH) must first be tested using the Schoenfeld residuals and their relationship with time for each predictor variable. If there is no significant correlation between the residuals and time, this assumption is considered valid. In this way, the results of CPH could be interpreted otherwise

parametric survival models should be applied.

Accelerated Failure Time (AFT) models are important parametric models for survival time, where the acceleration factor is assumed to remain constant over time. Exponential, Weibull, Log-Logistic, and Log-Normal models are examples of AFT models. In this article unshared Frailty AFT model was fitted to data; Frailty is a random component designed to account for variability due to unobserved individual-level factors that is otherwise unaccounted for by the other predictors in the model. Shared and unshared frailty models are two common type of this model using for analyzing survival data. For unshared frailty models, a subject's survival is assumed to be independent of the survival of other subjects in the study population. In this way, the frailty term ϑ is an unobserved multiplicative effect on the hazard function, assumed to follow a distribution $g(\vartheta)$ (where $\vartheta > 0$) with a mean of 1 and variance θ , estimated from the data ($\vartheta \sim g(1, \theta)$). The conditional hazard function for an individual, given frailty ϑ , can be expressed using Equation (5) as:

$$h(t|\vartheta) = \vartheta h(t) \quad (5)$$

Individuals with frailties $1 < \vartheta$ or $1 > \vartheta$, compared to those with frailty $\vartheta = 1$, have higher (lower survival probability) and lower (higher survival probability) risks, respectively. Given the relationship between survival and hazard functions, the conditional survival function corresponding to $h(t|\vartheta)$ is obtained as the following equation:

$$S(t|\vartheta) = S(t)^\vartheta \quad (6)$$

when the fragility distribution, $g(\vartheta)$, is specified, the unconditional survival function can be calculated using Equation (7):

$$S_U(t) = \int S(t|\vartheta)g(\vartheta)d\vartheta \quad (7)$$

The corresponding unconditional hazard function can also be calculated as follows:

$$h_U(t) = \frac{-d[S_U(t)]/dt}{S_U(t)}$$

In theory, any distribution with a mean of one can be considered as a fragility distribution (34). To determine the suitability of AFT models, criteria measures and graphical methods based on the probability distribution function and cumulative hazard function could be used. AIC is a criterion that measures the trade-off between model complexity and goodness of fit, and the smaller the AIC value, the better the model. In this study, AIC was calculated using the following formula:

$$AIC = -2 \times \log(\text{likelihood}) + 2(p + k) \quad (8)$$

where p is the number of parameters in the model, and k is a constant factor that depends on the type of model: for the Exponential model, $k = 1$, for Weibull, Log-Logistic, and Log-Normal models, $k = 2$, and for the Gamma model, $k = 3$. The BIC is calculated similarly and is used as another criterion for model selection, taking both model complexity and the number of observations into account.

$$BIC = -2 \times \log(\text{likelihood}) + k \ln(N) \quad (9)$$

where N is sample size. Unshared frailty AFT models are compared using AIC and BIC values, with the one exhibiting the smallest values being selected as optimal model.

Graphical methods for model selection, while useful, are inherently subjective. Although necessary, they are not sufficient on their own and are best employed as confirmatory tools alongside established criterion-based measures (e.g., AIC/BIC). For example, following the computation of AIC and BIC values across competing models, if the Weibull

distribution demonstrated the smallest values for both criteria (AIC/ BIC). This statistical evidence was further corroborated by graphical analysis: the plot of $\log[-\log(\hat{S}(t))]$ against $\log(t)$ exhibited a linear trend (35), confirming the Weibull distribution as the appropriate fit for the data.

Results

It is important to note that 36.5%, 50.1%, and 13.4% of divorced women without children fall into the age groups of 15-25 years (first age cohort), 25-35 years (second age cohort), and 35 years and older (third age cohort), respectively. Below, the descriptive statistics of the predictor variables studied are discussed as follows:

Family-related factors: The majority of fathers (23.9%) and mothers (29.0%) of divorced women had a primary and secondary education, respectively. While, the fathers and mothers of their spouses were mostly illiterate (28.8% and 34.1%, respectively). The highest percentage of ethnicity among the fathers of divorced women (49.7%) and their spouses' fathers (50.7%) was Persian. Additionally, over 50% of the families of both divorced women and their spouses spoke Persian as their first language (62.9% and 59.3%, respectively). After Persian ethnicity and language, Turkish and Kurdish were the next most common ethnicities and languages. 68.2% of the fathers of divorced women and 70.8% of the fathers of their spouses were employed.

Factors related to the women themselves: 81.7% of the fathers and 89.3% of the mothers of divorced women were alive. 55.9% of the mothers of divorced women were of Persian ethnicity. 64.4% and 19.6% of their families had no income and had an income of less than one million Toman, respectively. 66.7% of the paternal families of divorced women earned 2 million Toman or less. 88.9%, 91.5%, and 72.5% of them did not have their own home, lived in urban

areas, and did not have any kinship relation with their spouse.

Women's time spent factors (weekly): 84.0%, 26.9%, and 19.0% of divorced women did not participate in educational classes, did not visit their relatives, and did not converse with their spouses, respectively. Most of these women spoke with their spouse for less than 5 hours a week (71.0%) and visited their relatives (48.8%). Only 21.4% of them had working hours or participated in vocational training classes in the week, and 62.3% of them spent 15 or more hours a week on cultural activities (including watching TV and satellite, going to the cinema, reading, using social media, exercising, and listening to music). 37.5% of them allocated some time each week to religious activities.

Factors related to Women and their spouses: 74.2% of divorced women were unemployed, while 80.8% of their spouses were employed. The majority of divorced women (49.0%) and their spouses (45.8%) had diploma or secondary education. 34.8% of these women and 27.2% of their spouses had higher education. 47.8% and 42.6% of divorced women, and 12.4% and 68.4% of their spouses, respectively, married at ages younger than 20 and between 20-30 years old. Most divorced women and their spouses had 2-3 siblings (42.2% and 35.8%, respectively).

Spousal homogamy factors: Most divorced women had the same ethnicity (79.7%) and language (77.0%) as their spouses, and both families of the couples had no history of divorce (32.6%). The number of divorces in both families of the couple was similar (48.0%). The spouse's marriage age was higher than the wife's (82.1%), and the spouse had more siblings than the wife (43.7%). The father of the wife was more educated than the father of the spouse (37.3%). The wife had more education than the spouse (40.3%). The mother of the wife was more educated than the spouse (37.1%). 23.0% of both spouses

were employed, and 16.2% were both unemployed.

Divorce-related factors: Most divorced women applied for mutual consent divorce (67.2%). After the divorce, they returned to their paternal home (75.9%). They did not request their dowry (56.3%), and they did not have the right to divorce (81.2%). They faced parental interference in their marital life (62.9%). They sought counseling after marital problems started (41.8%). There was a history of divorce in their own family (62.5%) and their spouse's family (67.4%). They were inclined to meet their ex-spouse after divorce (86.6%) and to remarry (55.4%). Most of them had one year of marital resilience (64.2%) from the time marital problems began until the divorce. The most common reason for divorce was the spouse's poor temper (41.8%), followed by moral compatibility (4.5%), addiction (11.7 %), physical and sexual illness (3.2 %), the interference from family and others (6.6 %), economic issues (6.4 %), domestic violence (2%), sexual deviations (5.1%), consumption of alcoholic beverages (0.2%) and others (16.8 %). Only 3.2% of them cited physical and sexual diseases as the reason for the divorce.

Marriage-Related factors: 70.4% of divorced women made the decision about their marriage themselves, and 69.1% met their spouse through acquaintances. 71.9% did not have premarital counseling. 79.5% did not have informal or formal relationships before marriage.

Macro-level provincial factors: Most divorced women lived in provinces with a moderate divorce rate (69.7%) among married individuals, and in regions with medium HDI (64.2%).

The survival duration of the first marriage for these women was distributed as follows: less than one year (1.2%), 1-2 years (6.2%), 2-3 years (10.7%), 3-4 years (15.1%), 4-5 years (12.8%), 5-10 years (39.4%), and 10 years or more (13.4%). The median survival time for the first marriage of these

women was estimated to be 67 ± 4.28 months (5 years and almost 8 months). Approximately 80% of divorces among these women occurred within the first 106 months after marriage. Non-parametric analyses of the survival duration of the first marriage for these women revealed significant associations with various predictor variables as follows:

- **Factors related to women themselves:** Father's living status ($p < 0.01$), Mother's living status ($p < 0.05$), Ownership of residence ($p < 0.05$), Kinship status ($p < 0.05$), and Family income ($p < 0.001$).
- **Families' related factors:** Father's job status ($p < 0.05$).
- **Factors related to women and their spouses:** Job status ($p < 0.001$), Educational level ($p < 0.05$), Number of siblings ($p < 0.001$), Marriage age ($p < 0.05$).
- **Divorce related factors:** Type of residence after divorce ($p < 0.05$), Divorce request ($p < 0.01$), Emotional divorce ($p < 0.001$), Marriage resilience ($p < 0.001$), and Desire to meet spouse after divorce ($p < 0.01$).
- **Spousal homogamy factors:** Job status homogamy ($p < 0.001$).
- **Marriage related factors:** Number of years of formal acquaintance ($p < 0.001$), Satisfaction with marital relationship ($p < 0.05$).
- **Women's time spent factors:** Hours spent on employment ($p < 0.001$).

The results from testing the significance of the correlation between Schoenfeld residuals and time for examining *PH* assumption, indicate that for some predictor variables, such as spouse's mother's education years ($p\text{-value} = 0.038$), the father's ethnicity ($p\text{-value} = 0.004$), the family first language ($p\text{-value} = 0.004$), the type of residence after divorce (rented: $p\text{-value} = 0.035$, parental: $p\text{-value} = 0.036$), requesting dowry ($p\text{-value} = 0.027$), the number of divorces in the family ($p\text{-value} = 0.038$), marriage resilience ($p\text{-value} < 0.001$), emotional

divorce ($p\text{-value} < 0.001$), and HDI ($p\text{-value} = 0.002$), the test was significant, suggesting that these predictor variables are dependent on time. Furthermore, the overall test, which examines the overall dependence of all predictor variables on time, also confirms this (Chi-square = 0.183 and $p\text{-value} < 0.001$). Therefore, the *PH* assumption does not hold for all the predictor variables, and the results from the Cox Proportional Hazards (*CPH*) model are invalid and cannot be interpreted. As a result, the findings from the fitting of this model were disregarded.

When *PH* assumption is not satisfied in the *CPH* model, and there are a large number of predictor variables, Random Survival Forests (*RSF*) provide a suitable non-parametric alternative for reducing the dimensionality of the predictor variables in survival data analysis. To select the most efficient *RSF* algorithm for analyzing *FMS* of childless divorced women, performance indicators for Kaplan-Meier (*KM*), *CPH* model, *RSF1*, *RSF2*, *RSF3*, and *CIF* models are calculated and compared in Figure (1).

The most suitable *RSF* will be chosen based on its prediction performance, which is evaluated using prediction error, Harrell's Concordance Index (C-index), and Brier scores. These indicators will help identify the most important predictor variables that influence the survival of the first marriage for these women. The first performance evaluation indicator for the *RSF* algorithms is C-index, and the results for the *FMS* in this study are shown in the boxplot of the C-index (Figure 1a).

According to the results shown in this boxplot, the range of changes in C-index for the *CPH* model is very limited. The median value of this index for the *RSF* with Log-Rank Split Rule (*RSF1*) algorithm (C-index = 0.7515, with an error of 0.2485) is higher than that of the Conditional Inference Forest (*CIF*) model (C-index = 0.7256, with an error of 0.2744), the *RSF* with Brier

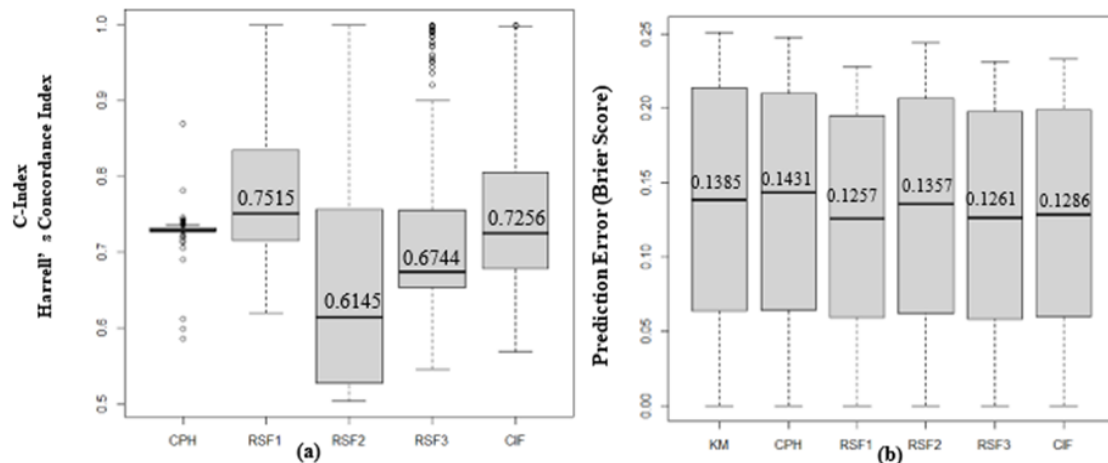


Figure 1- Box Plot of C-index for Different Algorithms in Survival Forests of the First Marriage of Childless Divorced Women (a), Boxplot of Prediction Error (Brier Scores) for Various RSF Algorithms for FMS of Childless Divorced Women (b)

Score Gradient Split Rule (*RSF3*) (C-index = 0.6744, with an error of 0.3256), and the RSF with Log-Rank Score Split Rule (*RSF2*) (C-index = 0.6145, with an error of 0.3855). Therefore, based on the median value of C-index (0.7515), the prediction performance of the RSF with *RSF1*, with an error of 0.2485, is the most suitable for analyzing the survival of the childless divorced women *FMS*, compared to the other models.

The second indicator for evaluating the prediction performance of the survival forests is the prediction error, which is represented by the Brier scores for all observations. Figure (2b) compares the prediction error for various models, including Kaplan-Meier (*KM*), *CPH*, *RSF1*, *RSF2*, *RSF3*, and *CIF*. This boxplot highlights the comparison of the prediction error for each of these models, showing how well each model performs in predicting the survival of the first marriage of childless divorced women based on their Brier scores.

The minimum prediction error across all survival forest algorithms is nearly identical. However, the maximum prediction error for the *RSF2* algorithm is higher than the other survival analysis models. The distribution of prediction error values for all models is nearly symmetric. Based on the results of this indicator, the

median prediction error values for the different algorithms are as follows: *RSF3*= 0.1261, *RSF1*=0.1257, and *CIF*= 0.1286, which are closely aligned.

Based on the minimum prediction error, the *RSF1* algorithm, with a value of 0.1257, performs better than the other models. Another performance indicator for comparing survival forest models is the Integrated Brier Score (*IBS*). According to the results, the values of this indicator, listed in ascending order, are: *RSF1*= 0.058, *RSF3*= 0.061, *CIF*= 0.065, *CPH*= 0.076, *RSF2*= 0.078, and *KM*= 0.085. Based on the *IBS* performance indicator, the *RSF1* algorithm is the most efficient in of childless divorced women *FMS*, as it has the lowest *IBS* value compared to other models. Considering the performance indicators such as C-index, *IBS*, and Prediction Error, the *RSF1* algorithm proves to be the most effective for analyzing the factors influencing the childless divorced women *FMS* in this study.

In order to identify the most significant predictor variables in analyzing the first marriage survival of childless divorced women, the minimum depth values and ranked variable importance scores are plotted in Figure (2) using the *RSF1* algorithm.



Figure 2 - Importance of Variables Based on Ranking Depth and Variable Importance in RSF1 Model

The variables are ranked according to their importance and depth scores along the X and Y axes, respectively. This diagram is divided into four quadrants, where; Top-right quadrant (Zone 4): Variables with low importance and depth, Bottom-right quadrant (Zone 2): Variables with low importance but high depth, Top-left quadrant (Zone 3): Variables with high

importance but low depth, Bottom-left quadrant (Zone 1): Variables with both high importance and depth. The variables along the diagonal line (the median line) indicate those with equal ranking in both importance and depth. As seen in the plot, the most influential variables in predicting FMS for these women are located in the Bottom-left quadrant (Zone 1). Based on the results of this figure, the variables in Zone (1) are

marriage age, spouse's marriage age, emotional divorce, number of hours spent on employment, Education years, number of years of formal acquaintance, number of siblings, number of counseling sessions after marriage issues, spouse's educational years, married divorce rate, HDI, job status, spouse's mother's educational years, number of years of informal acquaintance, number of hours spent with spouse, number of hours spent on cultural activities, mother's educational years, number of hours spent visiting relatives, spouse's number of siblings, father's educational years, spouse's father's educational years, divorce applicant (man), father's living status, residence after divorce (paternal), number of hours spent on religious activities, and number of hours spent on learning activities. These are the selected predictor variables in the survival analysis of the first marriage of childless divorced women using the Random Survival Forest (*RSF1*) algorithm with logarithmic rank partitioning rules, which will be used in subsequent analyses.

In this section, first of all, the non-parametric log-rank test was performed to compare FMS of childless divorced women based on selected predictor variables. The results of this test showed a significant difference only in the survival of their first marriage by the father's survival status (p -value = 0.01), hours spent on employment (p -value < 0.001), job status (p -value < 0.001), educational level (p -value = 0.012), number of siblings (p -value < 0.001), marriage age (p -value = 0.043), years of formal acquaintance (p -value < 0.001), residence after divorce (p -value = 0.012), divorce applicant (p -value = 0.006), and emotional divorce (p -value < 0.001). FMS for divorced women was longer if the father was deceased, the woman was employed, illiterate, the applicant of the divorce, or residing in owned housing after divorce. Additionally, as the number of working

hours, years of formal acquaintance, number of siblings, and years of physical separation before formal divorce increased, the FMS for childless divorced women became longer. However, as their marriage age increased, their FMS shortened.

Figure (3) illustrates survival functions of childless divorced women's FMS by significant non-parametric log-rank test predictors. Next, the *CPH* model is re-fit to FMS based on selected predictor variables of these divorced women. The results show that for the predictors, HDI (p -value = 0.005), educational years (p -value < 0.001), marriage age (p -value = 0.016), job status (p -value = 0.023), father's educational years (p -value = 0.042), Father's living status (p -value = 0.003), spouse's marriage age (p -value = 0.003), spouse's educational years (p -value = 0.041), emotional divorce (p -value < 0.001), divorce applicant (p -value = 0.004), and number of hours spent on employment activities (p -value = 0.010), the test is significant, and the dependency of these variables on time is confirmed. The results of the overall test, which examines the dependency of all predictor variables on time, also confirm this (Chi-square = 45.72 and p -value < 0.001). Therefore, since the *PH* assumption does not hold for all the predictor variables, the results of the *CPH* model are invalid and not interpretable. Hence, *AFT* parametric survival models are used to analyze this survival data.

Table (1) shows the *AIC* and *BIC* values for the Exponential, Weibull, Log-Logistic, Log-Normal, and Generalized Gamma survival time models in the analysis of the first marriage survival of childless divorced women. Based on the results from this table, the lowest values of the *AIC* and *BIC* correspond to the *AFT* Weibull model. This model is selected as the final fitted model

for the analysis of the first marriage survival of this women.

Additionally, the values of $\log[-\log\hat{S}(t)]$, plotted against $\log(t)$, in Figure (4) show that the data are scattered linearly with a

positive slope. Therefore, the selection of the Weibull distribution for the analysis of the first marriage survival data of these women is confirmed.

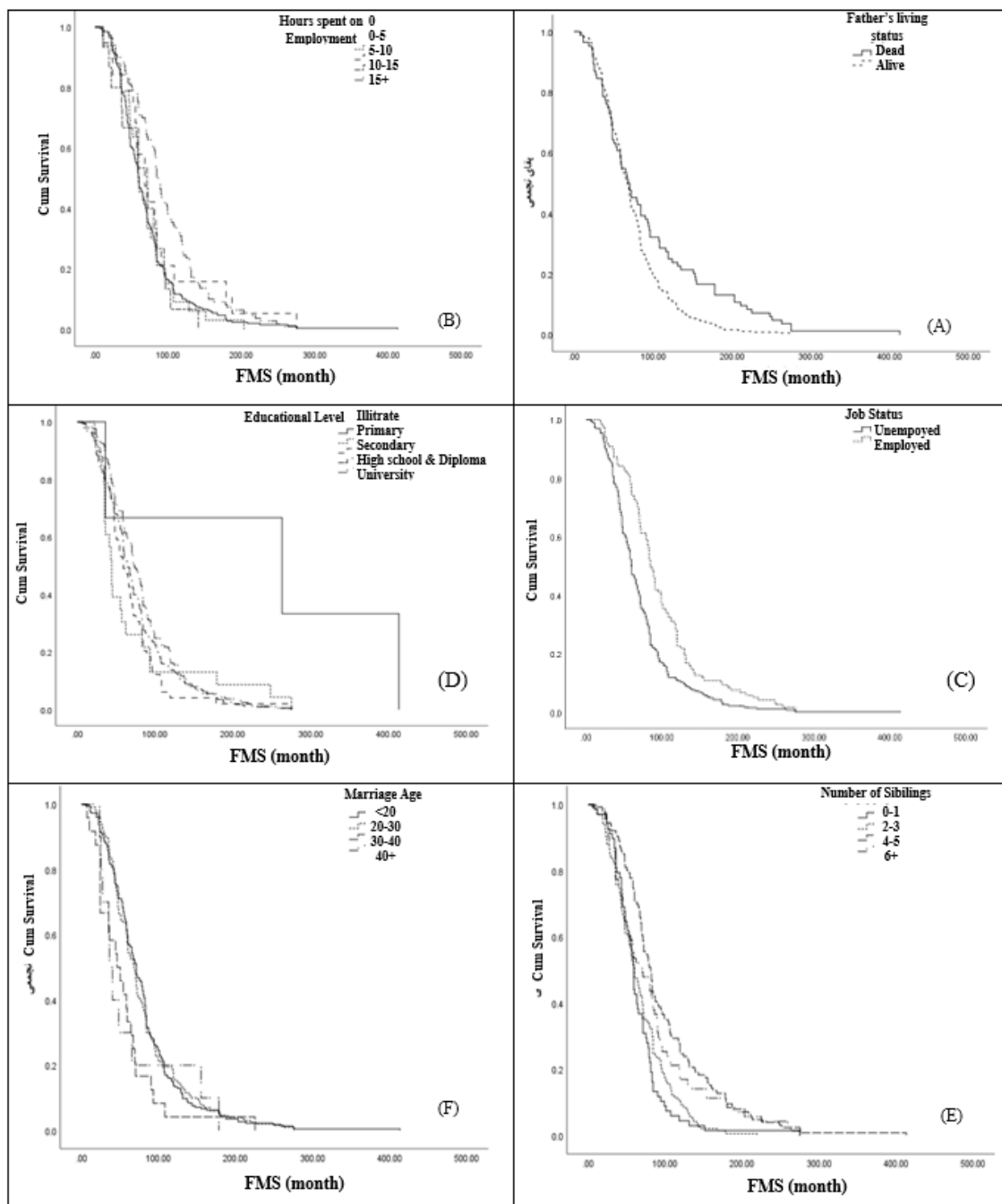


Figure 3. Survival functions of childless divorced women's FMS by father's survival status (A), hours spent on employment (B), job status (C), educational level (D), number of siblings (E), and marriage age (F).

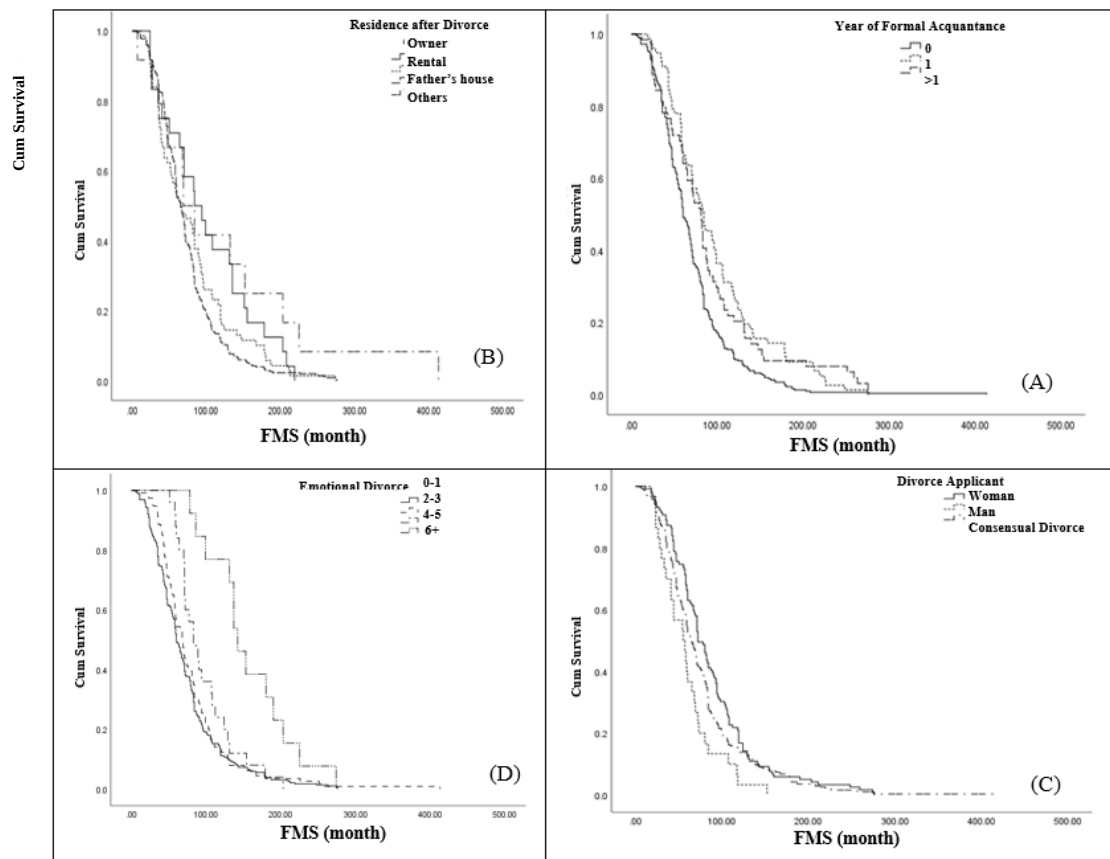


Figure 3. Survival functions of childless divorced women's FMS by years of formal acquaintance (A), residence after divorce (B), divorce applicant (C), and emotional divorce (D) (Continued)

Table 1 - AIC and BIC values for AFT models of childless divorced women FMS

Models	BIC	AIC
Exponential	1262.074	1125.529
Weibull	953.358	812.675
Log-Logistic	994.297	853.614
Log-Normal	977.989	837.307
Generalized Gamma	972.922	828.801

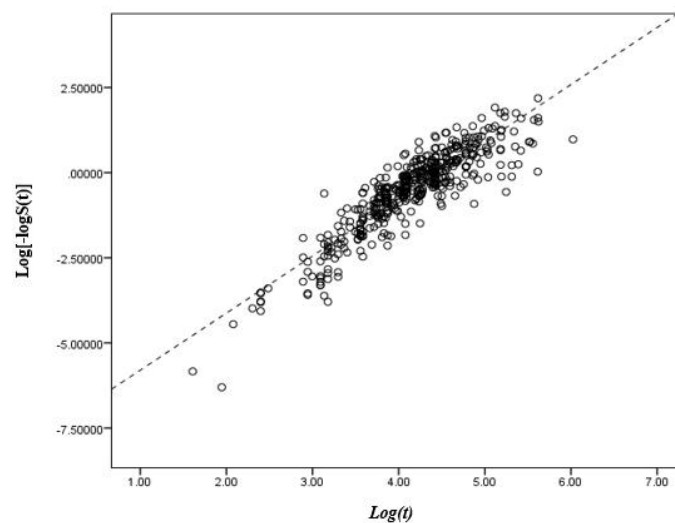


Figure 4-Weibull Distribution Assessment for the Survival of First Marriage of Childless Divorced Women

According to the *AFT* Weibull model, The shape parameter in this model is estimated to be 1.980, indicating that the risk of divorce for childless divorced women increases with time. the predictor variables of marriage age (p-value= 0.038), job status (p-value<0.001), mother's years of education (p-value=0.024), father's living status (p-value<0.001), spouse's marriage age (p-value=0.014), spouse's years of education (p-value=0.010), emotional divorce (p-value<0.001), residence after divorce (father's) (p-value=0.029), and the applicant for divorce (man) (p-

value<0.001) are significant predictors of the survival of first marriages for childless divorced women.

Next, unshared frailties Weibull model with and Gamma and Inverse Gaussian distributions is fitted to the survival of these women's first marriages. Table (2) presents the estimated variance of the frailty distribution (θ) and the model fit criteria for these models. The unshared frailty variance significance with Gamma and Inverse Gaussian distributions in the model was examined using the likelihood ratio test.

Table 2 - Estimated variance of the frailty distribution (θ) and model fit criteria for the unshared frailty weibull model with Gamma and Inverse Gaussian distributions for analyzing childless divorced women *FMS*

Frailty Distributions	Frailty Distributions Variance of (θ)	P-value of likelihood ratio test	Log-likelihood	BIC	AIC
Gamma	0.711	0.041*	-369.715	941.761	805.430
Inverse Gaussian	0.930	0.872	-378.195	958.721	822.390

*significant in 0.05 level

Comparing the *AIC* of fitted models in table (2), and *AFT* Weibull model in table (1), show that unshared Gamma frailty weibull model should be considered as final fitted model. In this model, variance of frailty was significant (p-value=0.041); indicating dispersion exists in the variance of frailty in individual level, so the fitted model is correct.

Table (3) presents the results of this model; The shape parameter in the model was estimated at 3.005, indicating that the hazard of divorce for childless divorced women with the same individual characteristics increases over time.

According to the results in this table, the following variables had significant effects on the childless divorced women *FMS*: HDI (p-value= 0.047), educational years (p-value=0.014), marriage age (p-value = 0.009), job status (p-value= 0.011), mother's educational years (p-value= 0.004), father's living status (p-value= 0.014), spouse's educational years (p-value= 0.034), emotional divorce (p-value< 0.001), divorce regret (p-value= 0.035), divorce applicant (p-value= 0.034).

The following interpretations can be derived from Table (3) regarding the selected significant predictor variables in the model:

Table 3: Results of Fitting the Unshared Gamma Frailty Weibull Model for Analyzing Childless Divorced Women FMS Based on Selected Predictor Variables

Variables		α	AF Exp(α)	95% CI		Standard Error	Value of test statistics	P- value
				Lower Bound (LB)	Upper Bound (UB)			
Macro- level provincial factors	HDI	-2.122	0.120	-4.221	-0.022	1.071	-1.980	0.047*
	Married Divorce rate	-0.021	0.979	-0.060	0.018	0.020	-1.060	0.290
Factors related to women themselves	Number of siblings	0.012	1.012	-0.013	0.037	0.013	0.910	0.361
	Educational years	0.126	1.134	0.104	0.148	0.011	2.450	0.014*
	Marriage age	-0.117	0.889	-0.131	-0.103	0.007	-2.600	0.009*
	Job status employed Unemployed (ref)	0.277	1.319	0.063	0.491	0.109	2.540	0.011*
Family- related Factors	Father's educational years	0.010	1.010	-0.006	0.026	0.008	1.230	0.217
	Mother's educational years	-0.025	0.975	-0.201	-0.197	0.088	-2.860	0.004*
	Father's living status alive Dead (ref)	-0.174	0.840	-0.313	-0.035	0.071	-2.460	0.014*
Factors related to spouse	Spouse's number of siblings	0.005	1.005	-0.019	0.029	0.012	0.400	0.691
	Spouse's marriage age	-0.010	0.990	-0.022	0.002	0.006	-1.940	0.052
	Spouse's educational years	-0.020	0.980	-0.038	-0.002	0.009	-2.120	0.034*
Factors related to spouse's family	Spouse's father's educational years	-0.009	0.991	-0.024	0.007	0.008	-1.150	0.250
	Spouse's mother's educational years	0.006	1.006	-0.012	0.024	0.009	0.650	0.516
Marriage related factors	Years of informal acquaintance	0.023	1.023	-0.022	0.068	0.023	0.980	0.325
	Years of formal acquaintance	0.022	1.022	-0.031	0.075	0.027	0.830	0.409
Divorce- related factors	Emotional divorce	-0.097	0.908	-0.128	-0.066	0.016	-6.220	0.000*
	Number of cancelling after marriage issues	0.003	1.003	-0.005	0.011	0.004	0.710	0.476
	Residence after divorce	Owner	0.040	1.041	-0.366	0.446	0.190	0.849
		Rental	-0.223	0.800	-0.591	0.145	-1.190	0.234
		Father's house	-0.272	0.762	-0.625	0.081	-1.510	0.132
		Others (ref)						
	Divorce applicant	Man	-0.188	0.829	-0.384	0.008	-1.880	0.060
Women's time spent factors		Woman	0.121	1.129	0.009	0.233	2.120	0.034*
		Consensual Divorce						
	Hours spent on employment	-0.001	0.999	-0.005	0.003	0.002	-0.240	0.811
	Hours spent on religious activities	0.009	1.009	-0.011	0.029	0.010	0.870	0.387
	Hours spent on visiting relatives	0.002	1.002	-0.006	0.010	0.004	0.560	0.578
	Hours spent on learning activities	-0.007	0.993	-0.032	0.018	0.013	-0.540	0.590
	Hours spent with spouse	-0.009	0.991	-0.021	0.005	0.007	-1.200	0.229
Shap parameter log (scale)	Hours spent on cultural activities	0.000	1.000	-0.002	0.002	0.001	0.040	0.967
Shap parameter log (scale)		1.100		0.963	1.237	0.070	15.820	0.000**
Log (θ)		-0.341		-0.737	-0.141	0.102	-1.690	0.041*
Shap parameter		3.005				0.209		
Scale parameter		0.333				0.023		
θ		0.711				0.144		
log likelihood :-369.715								
likelihood-ratio test (LR) for $\theta = 0$: p-value<0.000								

- By calculating the Acceleration Factor (AF) for the HDI ($\exp(-2.122)=0.120$), it can be concluded that with an increase in the HDI among childless divorced women with the same individual characteristics, these women divorce 0.12 times sooner, meaning their first marriage has a shorter survival duration.

- By calculating the AF for educational years ($\exp(0.126)=1.134$), it can be concluded that with an increase in years of education among childless divorced women with the same individual characteristics, these women divorce 1.126 times later, meaning their first marriage lasts longer.

- By calculating the AF for marriage age ($\exp(-0.117)=0.889$), it can be concluded that with an increase in the marriage age among childless divorced women with the same individual characteristics, these women divorce 0.889 times sooner, meaning their first marriage has a shorter survival duration.
- By calculating the AF for job status ($\exp(0.277)=1.319$), it can be concluded that childless divorced women with shared individual characteristics who are employed, divorce 1.319 times later compared to unemployed one's with the same individual characteristics, meaning their first marriage lasts longer.
- By calculating the AF for mother's years of education ($\exp(-0.025)=0.975$), it can be concluded that with an increase in the mother's years of education among childless divorced women with the same individual characteristics, these women divorce 0.975 times sooner, meaning their first marriage has a shorter survival duration.
- By calculating the AF for father's living status ($\exp(-0.174)=0.840$), it can be concluded that childless divorced women with the same individual characteristics whose fathers are alive divorce 0.840 times sooner compared to those whose fathers are deceased, meaning their first marriage has a shorter survival duration.
- By calculating the AF for spouse's years of education ($\exp(-0.020) = 0.980$), it can be concluded that with an increase in the spouse's years of education among childless divorced women with the same individual characteristics, these women divorce 0.982 times sooner, meaning their first marriage has a shorter survival duration.
- By calculating the AF for emotional divorce ($\exp(-0.097)=0.908$), it can be concluded that with an increase in emotional divorce among childless divorced women with the same individual characteristics, these women divorce 0.908 times sooner, meaning their first marriage has a shorter survival duration.
- By calculating the AF for divorce applicant (woman) ($\exp(0.121) = 1.129$), it can be concluded that childless divorced women with the same individual characteristics who initiated the divorce, divorce 1.129 times later compared to those who did not initiate the divorce, meaning their first marriage lasts longer.
- By calculating the Acceleration Factor (AF) for the married divorce rate ($\exp(-0.021)=0.979$), spouse's marriage age ($\exp(-0.010)=0.990$), spouse's father's educational years ($\exp(-0.009)=0.991$), and hours spent on employment ($\exp(-0.001)=0.999$), learning activities ($\exp(-0.007)=0.995$), and with spouse ($\exp(-0.009)=0.991$), it can be concluded that with an increase in married divorce rate, spouse's marriage age, spouse's father's educational years, and hours spent on employment, learning activities, and with spouse among childless divorced women with the same individual characteristics, these women divorce, 0.98, 0.99, 0.99, 0.999, 0.995, and 0.99 times sooner respectively, meaning their first marriage has a shorter survival duration. It is important mentioning that the effect of married divorce rate (P -value=0.290), spouse's marriage age (P -value=0.052), spouse's father's educational years (P -value=0.250), hours spent on employment (P -value=0.815), learning activities (P -value=0.590), and with spouse (P -value=0.225) on FMS was not statistically significant.

- By calculating the AF for residence after divorce (rental) ($\exp(-0.223)=0.800$) and (father's house) ($\exp(-0.272)=0.762$), it can be concluded that childless divorced women with the same individual characteristics who reside in rental house and father's house respectively divorce 0.80, and 0.76 times sooner compared to those who reside in other residences after divorce, meaning their first marriage has a shorter survival duration. However, those who owned the residence ($\exp(0.040)=1.041$) got divorced 1.041 times later compared to those who reside in other residences after divorce. The effect of residence after divorce (rental) (P -value=0.254), and (father's house) (P -value=0.132), owner (P -value=0.840) on FMS was not statistically significant.
- By calculating the AF for number of siblings ($\exp(0.012) = 1.012$), father's educational level ($\exp(0.010) = 1.010$), spouse's number of siblings ($\exp(0.005) = 1.005$), spouse's mother's educational level ($\exp(0.006) = 1.006$), years of informal acquaintance ($\exp(0.023) = 1.023$), years of formal acquaintance ($\exp(0.022) = 1.022$), number of cancelling after marriage issues ($\exp(0.003) = 1.003$), and hours spent on religious activities ($\exp(0.009) = 1.009$), visiting relatives ($\exp(0.002) = 1.002$), and cultural activities ($\exp(0.000) = 1.000$), it can be concluded that childless divorced women with the same individual characteristics who had higher number of siblings, father's educational level, number of siblings of their spouse, spouse's mother's educational level, years of informal acquaintance, years of formal acquaintance, number of cancelling after marriage issues, hours spent on religious activities, visiting relatives and cultural activities got divorced 1.012, 1.010, 1.005, 1.006, 1.023, 1.022, 1.003, 1.009, 1.002, and 1.000 times later compared to those who did not initiate the divorce, meaning their first marriage lasts longer. It is important mentioning that the effect of number of siblings (P -value=0.361), father's educational level (P -value=0.217), spouse's number of siblings (P -value=0.691), spouse's mother's educational level (P -value=0.516), years of informal acquaintance (P -value=0.325), years of formal acquaintance (P -value=0.409), number of cancelling after marriage issues (P -value=0.476), hours spent on religious activities (P -value=0.387), visiting relatives (P -value=0.578), cultural activities (P -value=0.967) on FMS was not statistically significant.
- Job status showed the strongest risk-increasing effect on FMS (HR = 1.319, $\beta = 0.277$), while the HDI exhibited the strongest protective effect (HR = 0.120, $\beta = -2.122$). Crucially, HDI demonstrated the largest absolute effect, evidenced by its exponentiated coefficient's deviation from 1 ($|\beta| = 2.122$ for HDI vs. 0.277 for job status), indicating that its association with marriage duration was 7.7 times more pronounced ($(2.122/0.277)$) than that of job status.

Discussion

The aim of this study was to examine the most significant determinants affecting the survival of first marriages among childless

divorced women. The results of the conducted modeling are summarized in Table (4):

Table 4 - Results of the Unshared Gamma Frailty Weibull Model for Analyzing Childless Divorced Women FMS

Selected Predictor Variables by RSF1		Significant Selected Predictor Variables in the Survival Analysis of the First Marriage of Childless Divorced Women
Family-related factors	1-father's educational years, 2-mother's educational years, 3-spouse's father's educational years, 4-spouse's mother's educational years	1-mother's educational years ¹²
Factors related to women themselves	1- father's living status	1-father's living status ¹²
Women's time spent factors	1-hours spent on cultural activities, 2-hours spent on employment, 3- hours spent on learning, 4-hours spent on religious activities, 5-hours spent on visiting relatives,6- hours spent with spouse	
Factors related to women and their spouse	1-job status, 2-educational years, 3-number of sibilings, 4-marriage age, 5-spouse's educational year, 6-number of spouse's sibilings, 7-spouse'marrage age	1- marriage age ¹² , 2-spouse'marriage age 3-educational years ² , 5-spouse's educational year ¹² , 6-job status (employed) ¹²
Divorce-related factors	1-residence after divorce, 2-divorce applicant, 3-number of conseling after marriage issues, 4-emotinal divorce	1-emotional divorce ¹² , 2-divorce applicant (spouse) ¹ , 3-divorce applicant (woman) ² ,4-residence after divorce (father's house) ¹
Marriage-related factors	1-years of informal acquaintance, 2-years of formal acquaintance	
Macro-level provincial factors	1-Married divorce rate, 2-HDI	1-HDI ²
1-Significant at Weibull Model, 2-Significant at Unshared Gamma Frailty Weibull Model, Bold: increasing effect , non-Bold: decreasing effect		

According to the findings, HDI was considered as the primary development indicator (36). The findings of this study align with the aforementioned research (2-4), indicating that higher HDI values are associated with reduced survival of first marriages among childless divorced women. What makes the relationship between development and divorce significant are the secondary effects and consequences that development brings, which ultimately contribute to rising divorce rates in society. As a transitional process toward modernization, development introduces social transformations (e.g., population growth, urbanization, technological advancements,

and mass communication expansion), altering societal values and perspectives. These changes, in turn, reshape the structure of families and marriages, leading to greater acceptance of divorce in society and increased tolerance for divorce among individuals. Supporting this finding, Wang and Zhou (2010) identified a positive correlation between increasing GDP and rising divorce rates in China (37). Similarly, Mahmoudian and Khodamoradi (2010) highlighted that development is the primary driver of rising divorce rates in Iran, establishing a significant and direct relationship between development and divorce (38).

Additionally, Yousefi and Khodamoradi (2012), using data from the Iranian Census, the Statistical Yearbook of the Civil Registry, and the Ministry of Health (2006), arrived at similar conclusions (39). The findings of Diehol et al. (2018) showed that as development indicators in Iran have grown, the divorce rate has also increased significantly (1). In the short term, economic and social development factors, literacy levels, and employment in the industrial sector negatively affected divorce rates. However, in the long run, these relationships reversed, and the impact of these variables on divorce became positive. Many researchers have pointed out a direct relationship between higher women's education levels and divorce (22, 40, 41). However, education level was found to be correlated with the job status of childless divorced women ($p\text{-value} < 0.001$) in this study. Furthermore, more than half of university-educated women are employed, and the percentage of employed university graduates is higher than that of non-employed ones (55.2%). The results of this study showed that with an increase in the number of years of education, the survival rate of the first marriage among divorced women increases (the risk of divorce decreases). In line with the results of this study, Askari Nodoushan et al. (2019) found that having a high school or middle school education increases an individual's likelihood of divorce compared to those with higher education (a U-shaped relationship between education and divorce) (19). Dargahi et al. (2018), using provincial data from Iran between 2007-2015, explored the social factors of divorce in Iran and concluded that increased employment among educated women with higher education reduces divorce rates. Contrary to women's economic independence, educated women's employment may lead to more stability in families by reducing economic hardship. Therefore, if the growth of women's education and the expansion of higher

education are accompanied by job opportunities, the increase in family income leads to a higher expected value of married life and helps strengthen the family (42). The results of studies by Imanzadeh et al. (7) and Sadeghi et al. (43) showed that with an increase in education level, marital satisfaction significantly increases, and the desire for divorce decreases. Additionally, study by Rousti (2010) highlighted higher education as a factor preventing divorce (44). Doherty (2007) in his study in the U.S. found that low education is a significant factor in the tendency towards divorce (45). Sadeghi (2016) showed that education has a negative relationship with the likelihood of divorce, meaning that as women's education increases, the likelihood of being divorced decreases (11). Additionally, various studies (46, 47) suggest that the higher the education levels of spouses, the more appropriate their emotional responses to life situations, and educated individuals have a higher ability to solve family problems. It can be concluded that if the growth of education and the expansion of higher education for women is accompanied by the creation of job opportunities for them, the family income will increase, leading to a higher expected value of married life and contributing to the stability of the family and the survival of marriage.

In the present study, the variable of job status was the most significant predictors in FMS of childless divorced women. The employed women had a longer survival rate of their first marriage compared to unemployed women (lower divorce risk). 25.8% of childless divorced women were employed, and the percentage of university-educated employed women in this group was 55.2%. In fact, more than half of university-educated childless divorced women were employed. The results of this study align with the income effect of women's employment discussed in Sadeghi (2016) (11). Sadeghi (2016) noted that women's employment has both positive and negative effects on divorce. The positive

effect of employment for women is referred to as the independence effect, where increasing financial independence raises the likelihood of marital dissolution, as women can rely on their ability to manage their lives after separation and free themselves from a family where happiness is lacking. The doubt effect is another positive impact of women's employment on marital instability (11). Women's employment creates doubts about traditional gender roles at home, disrupting these roles and consequently affecting divorce. The negative effect of women's employment on divorce is marked by the "income effect," where women's employment increases the family income, thereby reducing economic pressure and increasing family stability (12). Ghiasi et al. (2010) also showed that unemployed women were more likely to divorce than employed women. In their study, the highest and lowest divorce tendencies were found among unemployed (housewives) and employed (office workers) women, respectively (41). Also, a study by Lee & Bampas (2008) showed that the relationship between women's employment and divorce is neither simple nor direct (12). If a woman's job is stable (full-time and permanent) with a high income, it helps stabilize the marriage; however, if a woman's job is irregular and takes long hours of her time, even with a high income, it does not contribute to family stability. Dargahi et al. (2018) noted that women's employment, despite its economic approach (independence effect), helps reduce family economic hardship and increases the stability of marital life by increasing family income (41).

Some of the researches show that marriages in adolescence are more likely to end in divorce. As age increases, emotional and psychological aspects decrease, and rational, calculating tendencies become more pronounced (45,48, 49). However, in the present study, marriage age was significant among childless divorced women, as it was found that with an

increase in marriage age, the survival of their first marriage decreased (the risk of divorce increased). In line with the results of this study, some scholars argue that marriage, like human growth, if delayed, can lead to weaknesses similar to old age, which disrupts marital quality (50). Ghiasi et al. (2010) found that women who married later than 30 had a higher tendency to divorce than women who married between 20-25 years of age. They pointed out that the increase in marriage age, which is a characteristic of the new era and the influence of modern values, causes individuals to approach issues more logically and less emotionally, which can become undesirable and concerning for their spouses and lead to conflict. As individuals age, their personalities become more rigid, and their adaptability, necessary for marital adjustment, decreases (41). The results of a study by Moltafet & Ahmadi (2008) in Darab also showed a direct and significant relationship between marriage age and divorce tendency. Another situation that may lead to divorce in older ages is when a woman hears her biological clock's message about the end of the ideal time for marriage (51). In such cases, women are forced to marry individuals with lower desirability (the wrong choice effect) with the goal of having children and experiencing motherhood (52). In this way, noted that if the wrong choice effect in older women is so large that it neutralizes their maturity, then the effect of marriage age on marital instability will be positive. A logical approach, free from youthful emotions, concern from spouses about such behaviors, the lack of necessary flexibility for marital adaptation, and the forced choice with unsuitable criteria for choosing a spouse, are some of the main reasons for the decrease in marriage survival in older ages for women.

Some researches showed that higher education for men reduces the likelihood of marital failure (23, 53). Contrary to these findings, in the present study, the number of years of spouse's education was significant

in the analysis of FMS of childless divorced women, and it had a negative effect on the survival of marriages. Most spouses of these women had high school or diploma education (45.8%). Additionally, 21.3% of their spouses had more education than their wives. Consistent with this finding, Ghiasi et al. (2010) showed that the higher the education level of the spouse, the higher the tendency toward divorce. Since women tend to seek better opportunities in marriage, when their spouses have higher educational levels, they may feel unsuccessful in achieving their desired goals. This leads to conflicts between their expected values and the conditions in their lives, which can cause dissatisfaction and ultimately affect the likelihood of divorce. As no study has directly investigated the impact of this variable on marriage survival, further research in this area is necessary (41).

In the context of marital conflicts, the role of the original families is crucial in either increasing or decreasing such conflicts, and thus affecting other family functions (54). In the present study, family interference was one of the predictors considered, but it was not a selected variable (over half of the divorced women experienced parental interference in their lives, with percentages of 62.9%). Therefore, in the modeling process, the variables related to the mother's education years, as well as father's living status, became influential. The findings revealed that mother's education years and the living status of the father had a significant effect on the survival of these women. The effect of increased parental education and the father's living status on FMS was found to be negative. In line with this, Rahmatollahi (2006) found that couples with shorter years of marital experience face more extraneous problems, such as interference from their original families, compared to those with longer years of marriage. The internal pressures from the primary family, such as excessive parental interference or pressure in spouse selection, can negatively

impact the marriage and turn it into an imposed one, creating additional stress regarding role acceptance. In general, interference or influence from the couple's families can be a root cause of conflicts from the beginning to the end of a marriage (21, 55, 56). It is important to pay attention to changing the attitudes of families regarding the new roles that children face in their newly formed lives to prevent unintended interventions, which can lead to marital conflicts. In this regard, the influence of individualism in today's youth and collectivism in their families can create a situation where family interference becomes a problem. Given the rapid technological and social changes in our society that contribute to evolving cultural and familial values, which may sometimes not be accepted by families, there should be an emphasis on pre-marital guidance and counseling for both couples and their families. Furthermore, the role of the couple's families in providing emotional, social, and financial support to strengthen their marital relationship should be continuously highlighted.

A review of the literature did not reveal any studies examining the impact of the divorce applicant (either spouse) on marital survival. However, a study by Rezazadeh et al. (2018) found that the majority of divorce applicants were women (65.3%) (9). In this study, only 20.7% of men and 14% of couples filed for divorce (mutual divorce). These findings align with Kalimijn & Poortman (2006), who reported that women typically make up about two-thirds of divorce applicants. In the present study, this variable was significant in analyzing the survival of the first marriage of childless divorced women (57). The majority of women in this group had agreed upon a mutual divorce (67.2%). Additionally, 25.8% of the women and 6.4% of their spouses were the applicants for divorce. The results showed that when women were the divorce applicants, their marriage survival rate increased compared to mutual divorce.

On the other hand, if their spouses were the applicants, the survival rate of the marriage decreased compared to mutual divorce. One reason for the increased survival of marriages among childless divorced women who petitioned for divorce could be due to the high percentage of them having the right to divorce (81.2%). These women may have endured an unsatisfactory marriage with the hope of improving their situation, knowing they could end it whenever they wished. However, when their spouses were the applicants, the survival of the marriage decreased, as they had taken the step to end the relationship when dissatisfied with their married life. Further research is needed to explore the increasing and decreasing factors related to marriage survival based on divorce applicants among childless divorced women.

Emotional divorce is often considered the precursor to formal and legal divorce (58). Rashid et al. (2019), in a study of 120 women visiting counseling centers in Hamedan, concluded that the widespread divorce trend among young people in recent years has created an epidemic of family breakdown and emotional detachment, leading to emotional separation between spouses (59). Many researchers view emotional divorce as the first step in the process of formal divorce and consider it indicative of deteriorating marital relationships, which are often replaced by alienation (60). Experts believe that the divorce process typically follows a sequence of minor conflicts, repeated minor conflicts, increasing severity, one spouse's reluctance or separation, long periods of quarrels, exhaustion from conflicts, emotional divorce, and finally, legal divorce (61). Consistent with these studies, in the present study, the increase in emotional divorce led to a decrease in the survival of the first marriage among childless divorced women. Among this group, 62.9% of the women experienced less than one year between emotional divorce and formal divorce, 24.5%

experienced 2-3 years, and only 8.1% experienced more than 4 years.

Conclusion

Implementing comprehensive policies that focus on creating stable and secure employment opportunities for educated women, reducing the average age of marriage, and addressing the underlying causes of emotional divorce is crucial for enhancing marital stability, particularly among childless women. Such measures should include promoting equal access to quality jobs, offering vocational training and career development programs tailored to women's needs, and fostering workplace environments that support work-life balance. Additionally, educational and awareness campaigns aimed at reducing societal pressures around marriage age and fostering healthier relationships can play a significant role. Addressing emotional divorce requires targeted interventions, such as counseling services, conflict resolution programs, and community support networks, to help couples build stronger emotional connections and resolve conflicts constructively. These efforts, combined with broader socio-economic reforms, can contribute to more stable marriages and improved well-being for women and families.

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Authors' contribution

Dr Arezoo Bagheri developed the study concept, design, analyzing data, and revision of the manuscript, and Dr Mahsa Saadati participated in drafting, writing the article and data interpretation.

Ethical considerations

Questionnaires were filled with the participants' satisfaction and written consent was obtained from the participants in this study

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Conflicts of interest

The authors declare that they have no conflicts of interest

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