Determinants of Time to First Marriage Among Rural Women in Ethiopia

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Abstract: Age at marriage is of particular interest because it marks the transition to adulthood in many societies; the point at which certain options in education, employment, and participation in society are foreclosed. This study aimed to investigate demographic and socioeconomic factors affecting age at first marriage in Ethiopian women. The data source used for the analysis was the 2011 Ethiopian Demographic and Health Survey, which is country representative survey. The study considered 10,417 women aged 15-49 years from nine regions and one city administration. Accelerated failure time model was used for identifying factors associated with age at first marriage. The median time for age at first marriage was 17 years (95% CI: 16.90, 17.10). Based on Akaike’s information criterion (AIC) the Log-logistic accelerated failure time model was found to be the best model in describing the age at first marriage among other candidate models. The result based on this model showed that region, women’s educational level, wealth index and religion significantly affect timing of first marriage. Women who had secondary and higher education prolonged time-to-first marriage by the factor of \( \phi = 1.42 \) and \( \phi = 1.46 \), respectively. Women from Oromia, Somali, SNNP and Dire Dawa have prolonged time to age at first marriage by \( \phi = 1.02 \), \( \phi = 1.05 \), \( \phi = 1.08 \), and \( \phi = 1.09 \) respectively. However, women from Amhara region (\( \phi = 0.89 \)), Benishangul-Gumuz region (\( \phi = 0.95 \)) and Gambela region (\( \phi = 0.95 \)) had a significantly higher risk of early first marriage compared to their counterparts in the Tigray region. The acceleration factors for middle wealth index and rich are 0.99 and 0.98 respectively using poor household reference. This implied that poor household women have longer time-to-age at first marriage. Improving girls and young women access to education is important for rising the women’s age at first marriage, which is vital for empowering them and enhancing their participation in any sector.

Keywords: Survival Data Analysis, Time to First Marriage, Accelerated Failure Time Model, Marriage

1. Introduction

Age at marriage is of particular interest because it marks the transition to adulthood in many societies; the point at which certain options in education, employment, and participation in society are foreclosed; and the beginning of regular socially acceptable time for sexual activity and childbearing [24]. Very early marriage is said to undermine other rights guaranteed by the convention, including the right to be protected from physical abuse and sexual exploitation and the right not to be separated from parents against one’s will [26]. Yet many girls, and a smaller number of boys, enter marriage without any chance of exercising their right to choose. Some are forced into marriage at a very early age; others are simply too young to make an informed decision about their marriage partner or about the implications of marriage itself. On the other hand, delayed marriage, are believed to bring in the issues of dating, premarital sex, unwanted pregnancy, abortion, STDs and HIV/AIDS [15].

As in most developing countries, early marriage is prevalent in Ethiopia. The 2000 Ethiopian DHS further reveals that 31% of women aged 25-49 years were married before age 15 and 70% of women in the same age group were married before age 18. The median age at first marriage in
the same year was 16 years [4]. The 2005 EDHS also maintains similar trends. The report shows that, nationwide, close to 44% women aged 25-49 were married before age 15 and 66% were married before age 18. In 2005, the median age at first marriage was 16.1 years [5].

Having realized that there are limited studies that have been carried out in Ethiopia and the differentials and socio-economic determinants of age at first marriage in the country are not adequately known, this study attempt to establish the differentials and determinants of age at first marriage in Rural Ethiopian setting.

2. Methodology

2.1. Source of Data

The data for this study was extracted from the published reports of Ethiopian Demographic and Health Survey [6]. It is the third survey conducted in Ethiopia as part of the worldwide DHS project. The principal objective of the 2011 EDHS was to provide current and reliable data on marriage, fertility and family planning behavior, child mortality, adult and maternal mortality, children's nutritional status, use of maternal and child health services, knowledge of HIV/AIDS, and prevalence of HIV/AIDS and anemia.

2.2. Sampling Design

The sample for the 2011 EDHS was designed to provide population and health indicators at the national (urban and rural) and regional levels. The 2007 Population and Housing Census, conducted by the CSA, provided the sampling frame for the 2011 EDHS sample was drawn. Administratively, regions in Ethiopia are divided into zones, and zones into administrative units called weredas. Each wereda is further subdivided into the lowest administrative unit, called kebele. During the 2007 census each kebele was subdivided into census enumeration areas (EAs), which were convenient for the implementation of the census.

The 2011 EDHS sample was selected using two stage cluster design and EAs were the sampling units for the first stage. The sample included 624 EAs, 187 in urban areas and 437 in rural areas. Households comprised the second stage of sampling. A complete listing of households was carried out in each of the 624 selected EAs from September 2010 through January 2011. A representative sample of 17,817 households was selected for the 2011 EDHS, of these, 16,702 were successfully interviewed. In the interviewed households 17,385 eligible women were identified for individual interview; complete interviews were conducted for 16,515. Women whose current ages are 15-49 years are included in the survey. Out of all 16,515 urban and rural respondents 10,417 rural women from nine regions and Dire Dawa city administration were included in the study. The data was analyzed using R and STATA statistical softwares.

2.3. Variables in the Study

The Response Variable

The response variable is time to first marriage. It is measured as the length of time from birth until the age at first marriage which is measured in years. During the survey all women were asked a series of questions regarding to their marital status and whether they had ever lived with a man. The response to this question constitutes the women age at first marriage and women who had not yet experienced the events resulting in right censoring of the data.

Explanatory Variables

Several predictors were considered in this study to investigate the determinant factors of time to first marriage. These are women education level, region, religion, women work status, wealth index, and mass media. All of these covariates are categorical.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Women education level</td>
<td>Women's level of education</td>
<td>0= No education; 1= Primary; 2= Secondary, 3= Higher</td>
</tr>
<tr>
<td>Region</td>
<td>Women's region</td>
<td>1= Tigrai, 2= Afar, 3= Amhara, 4= Oromiya, 5= Somali, 6= Benishangul-Gumuz,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7= SNNP, 8= Gambela, 9= Harara, 10= Dire Dawa</td>
</tr>
<tr>
<td>Religion</td>
<td>Women's religion</td>
<td>1= Orthodox, 2= Muslim, 3= Protestant, 4= Others</td>
</tr>
<tr>
<td>Women work status</td>
<td>Women's Working status</td>
<td>0= Not had work, 1= Had work</td>
</tr>
<tr>
<td>Wealth index</td>
<td>Household wealth index</td>
<td>1= Poor, 2= Middle, 3= Rich</td>
</tr>
<tr>
<td>Mass media</td>
<td>Access to mass media</td>
<td>0= No, 1= Yes</td>
</tr>
</tbody>
</table>

2.4. Methods of Data Analysis

This study was used accelerated failure time model to identify factors associated with age at first marriage.

Acceleration Failure Time Model

Although parametric models are very applicable to analyze survival data, there are relatively few probability distributions for the survival time that can be used with these models. In these situations, the accelerated failure time model (AFT) is an alternative to the Proportional hazards model for the analysis of survival time data. Under AFT models we measured the direct effect of the explanatory variables on the survival time instead of hazard. This characteristic allows for an easier interpretation of the results because the parameters measure the effect of the correspondent covariate on the mean survival time.

The AFT model states that the survival function of an
individual with covariate X at time t is the same as the survival function of an individual with a baseline survival function at a time \( t^* \exp(a'X) \), where \( a' = (a_1, a_2, \ldots, a_p) \) is a vector of regression coefficients. In other words, the accelerated failure-time model is defined by the relationship:

\[
S(t|X) = S_0(t \cdot \exp(a'X)), \text{ for all X} \tag{1}
\]

In this study the Weibull AFT, log-logistic AFT, and log-normal AFT Models were considered.

Model Selection: For comparing models that are not nested, the Akaike's information criterion (AIC) is used which is defined as:

\[
AIC = -2 \text{LogL} + 2(k+c+1) \tag{2}
\]

Where k is the number of covariates and c the number of model specific distributional parameters. Lower values of the AIC suggest a better model.

3. Results

A total of 10,417 rural women from nine regions and Dire Dawa city administration were included in the study. Out of the total women interviewed, 2,145(20.6%) did not get married at the time of the survey and none of the respondents had a marriage experience but unable to recall the age at first marriage (Left censored). Majority of the respondents, 64.3% of the respondents were married at the time of the survey and none of the respondents had a marriage experience before. About 12.2% of the respondents had an experience before. About 12.2% of the respondents were from Tigray, 9.8% from Afar, 16.2% from Amhara, 16.1% from Oromia, 5.5% from Somali, 9.9% from Benishangul-Gumuz, 15.1% from SNNP, 7.7% from Gambela, 4.1% from Harari region and the rest 3.4% from Dire Dawa.

With regard to educational attainment, about 64.3% of the respondents had no education, while 32.9% had primary education, and 2% had attended secondary education. About 64.6% of the women respondent had no any access of mass media. About 53.7% of the household's were classified as poor while 19.8% had middle income and 26.6% were rich. More than half (70%) of the women respondents had no work. Of the total women, 35.1% were Orthodox, 42.3% Muslim, 19.6% Protestant, and 3% of them were from other religion followers at the time of the survey. The overall median time of age at first marriage for Rural Ethiopian women is 17 years with 95% CI; (16.90, 17.10).

Accelerated Failure Time Model Results

The datasets was fitted using Weibull, log-logistic and log-normal AFT model. For age at first marriage data, multivariable AFT models of weibull, log-logistic, and log-normal distributions were fitted by including all the covariates those are significant in the univariable analysis at 20% level. To compare the efficiency of different models, the AIC was used. A model having the minimum AIC value was preferred. Accordingly, Log-logistic AFT model (AIC = 46,830.22) found to be the best for age at first marriage data sets from the given alternatives when including all the covariate those are significant in the uni-variable analysis. AFT models and the corresponding AIC values are displayed in table 2.

Table 2. Comparison of AFT Models Using AIC.

<table>
<thead>
<tr>
<th>Baseline Distribution</th>
<th>AIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weibull</td>
<td>49,916.13</td>
</tr>
<tr>
<td>Log-logistic</td>
<td>46,830.22</td>
</tr>
<tr>
<td>Log-normal</td>
<td>47,228.63</td>
</tr>
</tbody>
</table>

From the log-logistic accelerated failure time model, Women’s educational level when using no education as reference and religion (Orthodox as reference) prolong time-to-age at first marriage, while wealth index when using poor as reference and some categories of region when Tigray was reference statistically significantly shorten time-to-age at first marriage in Rural Ethiopia.

Under the log-logistic AFT model, from region category Affar region (p-value =0.181, \( \phi=1.02 \), 95% CI: (0.993, 1.039)) and Harari region (p-value=0.949, \( \phi=1.001 \), 95% CI :( 0.9731, 1.0288)) are not significant when compare to Tigray region. From the variable religion category Muslim was not significant when using orthodox as the reference category with (p-value=0.081, \( \phi =1.01 \), 95%CI: (0.998, 1.028)). Also, households with middle wealth index was insignificant by using poor households as a reference category with (p-value =0.292, 95%CI: (0.983, 1.005), \( \phi =0.99 \)).

Table 3. Log-logistic Multi-variable AFT Model for Age at First Marriage data.

<table>
<thead>
<tr>
<th>Covariates</th>
<th>Coef</th>
<th>Se(Coef)</th>
<th>( \phi )</th>
<th>95%CI for ( \phi )</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Region</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tigray</td>
<td>Ref</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Afar</td>
<td>0.01</td>
<td>0.01</td>
<td>1.02</td>
<td>(0.993,1.039)</td>
<td>0.181</td>
</tr>
<tr>
<td>Amhara</td>
<td>-0.1</td>
<td>0.01</td>
<td>0.89</td>
<td>(0.877,0.906)</td>
<td>0.000</td>
</tr>
<tr>
<td>Oromiya</td>
<td>0.02</td>
<td>0.01</td>
<td>1.02</td>
<td>(1.001,1.041)</td>
<td>0.036</td>
</tr>
<tr>
<td>Somali</td>
<td>0.05</td>
<td>0.01</td>
<td>1.05</td>
<td>(1.022,1.075)</td>
<td>0.000</td>
</tr>
<tr>
<td>Benishangul-G</td>
<td>-0.06</td>
<td>0.01</td>
<td>0.95</td>
<td>(0.926,0.965)</td>
<td>0.000</td>
</tr>
<tr>
<td>SNNP</td>
<td>0.07</td>
<td>0.01</td>
<td>1.08</td>
<td>(1.054,1.099)</td>
<td>0.000</td>
</tr>
<tr>
<td>Gambela</td>
<td>-0.05</td>
<td>0.01</td>
<td>0.95</td>
<td>(0.925,0.969)</td>
<td>0.000</td>
</tr>
<tr>
<td>Harari</td>
<td>0.001</td>
<td>0.01</td>
<td>1.001</td>
<td>(0.974,1.029)</td>
<td>0.949</td>
</tr>
<tr>
<td>Dire Dawa</td>
<td>0.09</td>
<td>0.02</td>
<td>1.09</td>
<td>(1.060,1.126)</td>
<td>0.000</td>
</tr>
<tr>
<td>Women education</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No education</td>
<td>Ref</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary</td>
<td>0.1283</td>
<td>0.01</td>
<td>1.14</td>
<td>(1.126,1.148)</td>
<td>0.000</td>
</tr>
<tr>
<td>Secondary</td>
<td>0.3526</td>
<td>0.02</td>
<td>1.42</td>
<td>(1.369,1.478)</td>
<td>0.000</td>
</tr>
</tbody>
</table>
From table 3 the estimated acceleration factor for women from Amhara, Oromia, Somali, Benishangul-Gumuz, SNNP, Gambela and Dire Dawa is estimated to be 0.89, 1.02, 1.05, 0.95, 1.08, 0.95, 1.09 with 95% CI; (0.877, 0.906), (1.001, 1.041), (1.022, 1.075), (0.926, 0.965), (1.054, 1.099), (0.925, 0.969), (1.06, 1.126) respectively by using Tigray region as reference category. This indicates women from Oromia, Somali, SNNP and Dire Dawa have prolonged time to age at first marriage compared to those in the Tigray region. However, women from Amhara region (ɸ =0.89), Benishangul-Gumuz region (ɸ =0.95) and Gambela region (ɸ =0.95) had a significantly shorter time to age at first marriage compared to their counterparts in the Tigray region. A study conducted by Tezera (2013) used data from 2011 EDHS to examine the effect demographic and socioeconomic variables to determine early marriage among women. The result of the study showed that educational level of women was found to be significant predictors for early marriage. Similar study in Malawi by Palamuleni (2011) also found that women education were statistically significant factor of age at first marriage. Also, Agaba et al (2011) indicates that educational attainment were strong socio-economic determinants of first marriage in Western Uganda.

The results of this study suggested that region of women was significant predictor for early marriage among women in Ethiopia. The result of the study revealed that region of women was significant predictor for early marriage. A similar study in Nigeria by Adebowale et al. (2012) also found that region was significantly associated with the timing of first marriage. Also another study in Vietnam by Lung Vu (2009) finds that region was significantly related to age at first marriage.

The result of this study revealed that household wealth index were significantly shortened time to age at first marriage among women in Rural Ethiopia. The median time of age at first marriage for Rural Ethiopian women was 17 years with 95% CI; (16.90, 17.10).

The findings of this study suggested that women’s educational level had a significant effect on time to age at first marriage with 5% level of significance and it prolonged age at first marriage by the factor of ɸ = 1.14, ɸ =1.42 and ɸ = 1.46 for primary, secondary and higher education respectively when compared to illiterate women. The result of the study shows that woman who had higher education was more survived than those uneducated and primary education. A similar study conducted in Ethiopian by Tezera (2013) used data from 2011 EDHS to examine the effect demographic and socioeconomic variables to determine early marriage among women. The result of the study revealed that educational level of women was found to be significant predictors for early marriage. Similar study in Malawi by Palamuleni (2011) also found that women education were statistically significant factor of age at first marriage. Also, Agaba et al (2011) indicates that educational attainment were strong socio-economic determinants of first marriage in Western Uganda.

4. Discussion

The findings of this study revealed that wealth index and Amhara, Benishangul-Gumuz and Gambela region have a significantly shorter time-to-age at first marriage while women’s educational level, religion, and from region category (Oromia, SNNP and Dire Dawa) prolonged time-to-age at first marriage among women in Rural Ethiopia. About 67.1% of women were married before age of 18 years. This indicates that early marriage is highest in Ethiopia. The

<table>
<thead>
<tr>
<th>Covariates</th>
<th>Coef</th>
<th>Se(Coef)</th>
<th>ɸ</th>
<th>95%CI for ɸ</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Higher Wealth index Poor</td>
<td>0.3762</td>
<td>0.03</td>
<td>1.46</td>
<td>(1.380,1.540)</td>
<td>0.000</td>
</tr>
<tr>
<td>Middle</td>
<td>0.0062</td>
<td>0.01</td>
<td>0.99</td>
<td>(0.983,1.005)</td>
<td>0.292</td>
</tr>
<tr>
<td>Rich</td>
<td>-0.0246</td>
<td>0.01</td>
<td>0.98</td>
<td>(0.965,0.987)</td>
<td>0.000</td>
</tr>
<tr>
<td>Women work status Not had work</td>
<td>0.004</td>
<td>0.00</td>
<td>0.99</td>
<td>(0.986,1.006)</td>
<td>0.419</td>
</tr>
<tr>
<td>Had work</td>
<td>0.01</td>
<td>0.01</td>
<td>1.01</td>
<td>(0.998,1.028)</td>
<td>0.081</td>
</tr>
<tr>
<td>Religion Orthodox</td>
<td>0.02</td>
<td>0.01</td>
<td>1.02</td>
<td>(1.006,1.039)</td>
<td>0.009</td>
</tr>
<tr>
<td>Muslim</td>
<td>-0.0246</td>
<td>0.01</td>
<td>0.98</td>
<td>(0.986,1.043)</td>
<td>0.328</td>
</tr>
</tbody>
</table>

Coef : coefficient, Se: Standard error, ɸ : acceleration factor, CI : Confidence interval, Ref : Reference
marriage in Rural Ethiopian women. Compared to rich
women, poor women had relatively lower risk of first
marriage. This result contradicts with a study by Kamal
(2011) in the Ethnic Tribal women in Bangladesh. The
findings revealed that Parents’ economic status had the most
significant effect on marital timing. The higher the economic
status of the parents, the lower is the probability of age at
earlier marriage. Studies elsewhere suggest the opposite of
this, with poor women having a relatively higher risk of first
marriage (Haloi and Limbu, 2013; Hoq, 2013).

The result of this study also revealed that religion was an
important factor for age at first marriage of women in Rural
Ethiopia. Women from protestant religion had prolonged age
at first marriage by a factor of $\phi =1.03$ as compared to
Orthodox. These findings are similar to Tezera (2013) in
Ethiopia and the study showed that religion of women was
found to be significant predictors for early marriage. The
same study in Nigeria by Adebowale et al. (2012) found
religion were significantly associated with the timing of first
marriage. Another study by Agabaet al (2011) religion is
strong social determinant of first marriage in Western
Uganda. This result is consistent with Erulkar (2013) in
Ethiopia, Abdallah (2011) in Nigeria, Bayisenga (2012) in

5. Conclusions

The main objective of this study was modeling the
determinant of age at first marriage by using AFT models.
The result of Log-logistic AFT model showed that region,
women’s educational level, wealth index and religion were
found significant predictors to age at first marriage among
women in Rural Ethiopia. Among these significant
predictors, women’s educational level and religion of women
prolong age at first marriage while wealth index of the family
shortens timing of first marriage.

The study findings reveal that education is the most
significant variable affecting age at first marriage in rural
Ethiopia. Therefore, it is important that government policies
promote the status of women in rural Ethiopia by helping them
to have more access to education so that they can make their
own decision regarding when to get married. It is crucial to
continue improving girls and young women access to
education is important for rising the women’s age at first
marriage, which is vital for empowering them and enhancing
their participation in any sector. The education system should
aim at providing life skills to enable girls avoid early marriage
as well as providing reproductive health information so that
they are aware of the advantages of delayed marriage.

List of Abbreviations

- AFT= Accelerated Failure Time
- AIC= Akaike Information Criterion
- CI= Confidence Interval
- CSA= Central Statistics Agency
- DHS= Demographic and Health Survey
- EAs= Enumeration areas
- EDHS= Ethiopian Demographic and Health Survey
- HIV/AIDS= Human Immune deficiency Virus/Accuired
Immune deficiency Syndrome
- STDs= Sexual Transmitted Diseases

Declarations

Ethics approval and consent to participate
Human subject research approval for this study was
received from Jimma University Research Ethics Committee.

Availability of Data and Materials

The data sets analyzed in this study available from the
responding author on reasonable request. The R code used
to analyze the data provided as a supplement of the article.

Conflict of Interest

The authors declare that they have no competing interests.

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All the authors do not have any possible conflicts of
interest.

Author's Contributions

YM contributed to the study concept and design,
performed the analysis on the data set as well as wrote the
first draft of the paper. BB and DK contributed to the analysis
and interpretation of the data, in addition to drafting and
critical revision of the manuscript. DS contributed to the
study concept and design. All authors read and approved the
final manuscript.

References

Development in Nigeria: Contemporary Issues”, Journal of

(2012). Survival Analysis of Timing of First Marriage among
Women of Reproductive age in Nigeria: African Journal of
Reproductive Health.

of Age at First Marriage among women in Western Uganda.
SSAE, Makerere University, Uganda.

Education: A Developmental Challenge in Africa”, Journal of

Expansion and Changes in Women’s Entry into Marriage and
Motherhood in the Federal Republic of Germany, Journal of
Marriage and the Family 54 (2):302-315.


