# Modelling the Determinants of Age at First Marriage in Nigeria Using Cox Regression Models

Chukwu AU, Oyamakin SO* and Olugbemi FF

*Department of Statistics, University of Ibadan, Ibadan, Oyo-State, Nigeria*

## Abstract

This study analysed the demographic, socioeconomic and sociocultural factors that affect age at first marriage in the six geo-political regions in Nigeria. Data from 31482 married females aged 15-49 years obtained from the Nigerian Demographic and Health Survey (NDHS) 2013, were used. Descriptive methods were used to calculate mean and median ages at first marriage and Cox proportional hazard model was used to study the effect of demographic, socioeconomic and sociocultural variables, and to identify the magnitude and significance of their effects on age at first marriage. The study found that mean and median ages at first marriage in Nigeria were 18 and 25.5 years respectively. Mean and median ages at first marriage in North-East and North-West regions were low. At national level region had significant effect on age at first marriage, Northern regions had higher risk of marriage than Southern ones.

**Keywords:** Marriage; Cox Proportional Models; Demography; NDHS 2013

## Introduction

Biological scientists have established the fact that the function of the human body system declines with age [1]. The organs are gradually developed at growing ages until they reach the peak where they are well developed after which their effectiveness starts to decrease as age advances. The child bearing period of a woman is generally between the ages of fifteen and forty years. A woman's fertility peaks in the early and mid-twenties after which it starts to decline slowly with a drastic drop around thirty five. Menopause which is the cessation of menstrual period occurs in the forties and fifties mark the cessation of fertility [2-6]. However, age related infertility can occur earlier in some women due to some factors among which are their general health and nutrition. The relationship between a woman's age and fertility is referred to as her "biological clock". When a woman reaches the age at which fertility is commonly understood to drop, it can be said that her biological clock is ticking. However, the exact estimate of the probability of a woman's conception after certain age is not yet known. The family, which is a group of people, related by blood, marriage or adoption is an important institution because it is the building block of any society and the wealth of a nation depends on the health of the family [7-9]. It is important to study the factors that affect family formation decisions and one of such factors is age at first marriage [10-12]. Age is an important demographic variable that determines the extent to which certain characteristics can go. In Nigeria, premarital sex and birth outside marriage are frowned at for cultural and religious reasons; hence marriage becomes the basis of family formation and marks the beginning of regular exposure to the risk of fertility.

Age at first marriage is of interest because it determines the duration of such an exposure; hence, it affects fertility levels and population growth especially in countries where the use of contraceptives is low. Age at first marriage is an important indirect determinant of fertility because women who marry early will on the average have a longer period of exposure to the risk of pregnancy, often leading to higher completed fertility. Age at first marriage determines the age at first birth and at the long run influences the total number of children a woman bears throughout her reproductive period, in the absence of any active fertility control. Variation in age of entry into marriage explains the differences in fertility across populations [10].

Worldwide, more than 700 million women alive were married before their 18th birthday. More than one in three (about 250 million) entered into union before age 15. If there is no reduction in the practice of child marriage, up to 280 million girls alive are at risk of becoming brides by the time they turn 18. Child marriage among girls is most common in South Asia and sub-Saharan Africa [13]. Early or teenage marriage is very common in the northern part of Nigeria. Good percentage of Northern girls goes into first marriage as teenagers without formal education and any livelihood. Parents in this part of the country place more value

on girls because of bride price, so they take good care of them from childhood till they are physically matured only to give them out in marriage as teenagers. This calls for urgent attention by individuals and the government.

Early or teenage marriage has potentially harmful consequences both on individuals and the country at large. The young girls involved are deprived of basic human rights and ordinary life experiences other young people have [12, 14,15]. Many of them are forced to drop out of school. They are isolated from family, friends, and other sources of support. Their health is at risk because of early sexual activity and childbearing. One of the health risks is vesicovaginal fistula (a condition that does not allow the bladder to hold liquid, hence urine comes out as soon as it gets into the bladder) which is common in Northern Nigeria Countries with a high percentage of too early marriage are more likely to experience extreme and persistent poverty, and high levels of maternal and child mortality.

## Methods

### Cox's Proportional Hazard Model

Cox proportional hazard model was proposed by David Cox [6]. It is a popular model in survival analysis that can be used to assess the importance of various covariates in the survival times of individuals or objects through the hazard function. It is an appealing approach when confronted with survival time data without a clue to its underlying distribution. The model is called a semi-parametric model because it makes no assumption about the shape of the baseline hazard function [16-18].

The Cox model is given as:

$$h_i(t, x_i) = h_0(t) \operatorname{Exp}\left[\sum_{i=1}^{p} \beta_i x_i\right]$$

Where: $h_i(t, x_i)$ Denotes the resultant hazard, given the values of the p covariates for the respective case X = $(x_1, x_2, \ldots, x_p)$, B=$(\beta_1, \beta_2, \ldots, \beta_p)$ and the respective survival time (t) = T.

The first term on the right-hand side of the equation, $h_0(t)$ is the duration-dependent risk component of the hazard function otherwise known as the baseline hazard [19-22]. It is the hazard for the respective individual when the values of all the covariates are equal to zero while the second exponential term is relative risk component of the hazard function associated with having attribute *X*.

X is a vector of covariates.
B is a vector of parameters to be estimated.
*T* denotes duration to first marriage measured in years (i.e. age).

The data for this study were those of 31482 ever-married women aged 15-49 years obtained from the 2013 Nigeria Demographic and Health Survey. The DHS (now DHS+) program has conducted over 170 nationally representative surveys in about 70 countries throughout Africa, Asia, the Near East, Latin America, and the Caribbean. It is a survey that was designed to provide population and health indicator estimates at the national, zonal, and state levels [23-26]. The 2013 Nigeria Demographic and Health Survey (NDHS) implemented by the National Population Commission is the fifth in the series of Demographic and Health Surveys conducted so far in Nigeria; previous surveys were conducted in 1990, 1999, 2003, and 2008. Details of the survey are contained in the 2013 NDHS final report.

## Results

We present descriptive measures of age at first marriage in Table 1 and results of fitting the Cox proportional hazard model to age at first marriage in Table 2.

| Zones/Country | Median |
|---|---|
| North central | 25.5 |
| North-East | 22.0 |
| North-West | 22.5 |
| South-East | 25.0 |
| South-West | 24.0 |
| South-South | 24.5 |
| **Nigeria** | **25.5** |

**Table 1:** Mean and median ages at first marriage in the six zones and Nigeria

| Variables | Hazard Ratios |
|---|---|
| **Zones** | |
| North Central | 1.057 |
| North East | 1.294** |
| North West | 1.601** |
| South East | .926 |
| South South | .878** |
| Type of place of residence Rural | 1.053** |
| **Highest Educational Level** | |
| No Education | 1.551** |
| Primary | 1.870** |
| Secondary | 1.439** |
| **Religion** | |
| Catholic | .990 |
| Traditional | 1.164* |
| Islam | 1.467** |
| **Wealth Index** | |
| Poorest | 1.278** |
| Poorer | 1.170** |
| Middle | 1.094** |
| Richer | 1.144** |
| **Respondent's Current Age** | |
| 15-24 | 1.879** |
| 25-34 | 1.348** |
| **Age At First Sex** | |
| <15 Years | 31.839** |
| 15-24 | 5.957** |
| 25-34 | 1.851** |
| **Ethnicity** | |
| Hausa | 1.032 |
| Igbo/Ibo | .910* |
| Yoruba | .793** |

** p<0.01 and * p<0.05

**Table 2:** Results of Cox's Proportional hazard model analysis of age at first marriage in Nigeria

## Discussion and Conclusion

Mean and median ages at first marriage in North-East and North-West were low; this may be attributed to child and teenage marriage common in the zones. Women in these zones went into marriage as children or teenagers without any formal education. High median obtained in North-Central may be as a result of women's involvement in labor force. The high estimates obtained in the South-East may be due to high bride price a bridegroom is usually enforced to pay in the zone. Therefore, women tend to delay marriage until their men have worked for years so as to be able to pay the dowry.

Respondent's current age and age at first sex were significant across all the regions. Highest educational level was significant in North-East, South-East and South-South. It was less significant in North-Central and South-West and it was not significant in North-West. Religion was significant in all the regions except South-East where it was not that significant. Wealth index was significant in all the regions except in North-West and South-West where it was less significant. Ethnicity was significant in all the regions except South-East where it was not that significant. Type of place of residence was significant in all the regions except North West.

In view of the findings in the study, it is recommended that early exposure of girls to sexual activities should be discouraged by supporting religious bodies that prohibits premarital sex and organizing sex education in rural areas and schools. It is crucial to formulate policy that will encourage girls to go for further studies. Preference should be given to education in the nation's annual budgets. It is advisable to upgrade rural areas by establishing industries and providing more schools and social infrastructures. The

mentioned effort should be more concentrated in the Northern zones since these were the places where early age at first marriage is common in the in the country. There should be improvement of people's standard of living especially in North-East, North-West, and South-East where poverty led to early marriage among women. A law that will disallow women who are younger than 18 years from getting married should be enacted.

## References

1. Harman D (1956) Aging: A theory based on free radical and radiation chemistry. J Gerontol 11: 298-300.

2. Ahmad Kabir, Gulshana Jahan, Rukhshana Jahan (2001) "Female Age at Marriage as a Determinant of Fertility." J medi sci 1: 372-6.

3. Anuja Jayaraman, Tesfayi Gebreselassie, Chandrasekhar S (2007) "The Impact of Conflict on Age at Marriage and Childbirth in Rwanda". Macro Int Inc.

4. Copen CE, Daniels K, Vespa J, Mosher WD (2012) "First Marriages in the United States; Data from the 2006-2010 National Survey of Family Growth". Natl Health Stat Report 1-21.

5. Frederic G (2007)"Marriage Consent and the Age of Women at First Marriage in the Senegal River Valley" (preliminary version). University of Louvain-la-Neuve, Belgium.

6. Lawrence DE, Ikamari (2005) "The Effect of Education on the Timing of Marriage in Kenya". J Demographic Res 12: 1-28.

7. Matthews AP, Leclerc PM , Garenne Michel (2009) "The Picrate Model for Fitting the Age Pattern of Marriage". J Math Social Sci 47: 17-28.

8. Andrew KM (2013) "Fertility Transition and its Determinants in Kenya: Evidence from 1993 and 2003 KDHS". A PhD Thesis submitted to Population Studies and Research Institute, University of Nairobi.

9. John Hajnal (1953) "Age at Marriage and Proportion Marrying". J Popul stud 7: 111-36.

10. Anu N, Praveen S (2013) "Impact of Education and Age at Marriage on Fertility among Uttar Pradesh Migrants of Ludhiana, Punjab, India". Anthropologist 15: 225-30.

11. Sheela J, Audinarayana N (2000) "Determinants of Female Age at First Marriage in Tamil Nadu: An Analysis of NFHS Data". 46: 25-32.

12. Susheela Sing , Renee Samara (1996)"Early Marriage among Women in Developing Countries". J Int Family Planning Perspect 22: 148-57.

13.United Nations Children's Fund (2014) "Ending Child Marriage: Progress and prospects". New York.

14. Thomas E (2010) "Multilevel Survival Analysis of the Determinants of Age at First Marriage among Women living in Nigeria". A Master of Statistical Data Analysis dissertation submitted to Department of Sociology, Ghent University.

15. Isiugo-Abanihe UC (1994) "Nuptiality Patterns, Sexual Activity and Fertility in Nigeria" DHS Working Papers.

16. Matthews AP, Leclerc MP,. Garenne ML (2009) "The Picrate Model for Fitting the Age Pattern of Marriage". J Mathe Social Sci 47: 17-28.

17. Anjali H, Dhruba KL (2013) "Socio-Economic factors influencing the age at first marriage of Muslim women of a remote population from North-East India." Antrocom Online J Anthropol 9: 1.

18. Mensch BS, Singh S, Casterline  JB (2005) "Trends in the Timing of First Marriage among Men and Women in the Developing World" New York, Population Council 54.

19. Barbara V, Charles H (1979) "Age at First Marriage in Peninsular Malaysia" J Marriage the Family 41: 877- 91.

20. Cox DR (1972) Regression Models and Life-Tables. J  R Stat Soc 34: 187-220.

21. Hall Carl T (2002) "Study Speeds up Biological Clocks/Fertility Rates Dip after Women Hit 27". The San Francisco Chronicles.

22. Haviland WA, Prins Harald EL, McBride Bunny, Walrath D (2011)"Cultural Anthropology; The Human Challenge" 13th edn.

23. Mattias L (2010) "Documentation for Age at First Marriage of Women for Countries and Territories" A publication of The Gap minder Foundation, promoting sustainable global development Sweden, Stockholm.

24. Okafor UI (2014) "Determinants of Under-five Child Mortality in Nigeria: An Application of Cox and Cox Frailty Models". IOSR J Math 11: 42-6.

25. Peninah A, Atuhaire LK,  Rutaremwa G (2006) "Determinants of Age at first Marriage among Women in Western Uganda".

26. United Nations, Department of Economic and Social Affairs, Population Division (2013) "World Fertility Report 2012".