

MULTINOMIAL LOGIT REGRESSION ON AGE AT FIRST MARRIAGE AMONG NIGERIAN MEN AND WOMEN.

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ABSTRACT

Age at first marriage has important demographic and health effects on any population. The purpose of this study is to identify factors affecting age at marriage among men and women in Nigeria. This study used data obtained from 2005 National AIDS/HIV Reproductive Health Survey conducted in Nigeria. Multinomial logistic regressions were employed to examine the relationship between age at first marriage and some set of covariates which are thought to be influential factors. Age at first marriage varies by geo-political zone, location, religion, highest level of education attained, age at sexual initiation and circumcision status of respondents.

1.0 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. As such, marriage is not only the most predominant context for childbearing but also one of the most important determinants of fertility (Lesthaeghe et al., 1989). However, reproduction is not the only function of marriage. Marriage marks the beginning of a new family unit with all the complicated statuses and the roles that the members of this unit are expected to play. Changes in marriage pattern, for instance delayed marriage, are believed to bring in the issues of dating, premarital sex, unwanted pregnancy, abortion, STDs and HIV/AIDS (Jones, 2007).

Due to its importance, various researchers believe that understanding variations in age at marriage helps in explaining differences in fertility across populations and fertility within individual populations over time (United Nations, 1990; Ekeh and Dodo, 2001). Early marriage is associated with early childbearing particularly in the developing countries. Early childbearing is also related to low status of women and adverse health risks on the mother and child. Young mothers are more likely to experience pregnancy related complications and less able to deal with them, which often lead to maternal deaths (Zabin and Kiragu, 1998). Some studies indicate that marrying at an early age in certain parts of the world leads to higher rates of divorce (Jones, 1992; VandenHeuvel and McDonald,

1994). Delayed age at marriage (or late marriage) directly affects completed fertility by reducing the number of years available for childbearing. Late marriage permits women to complete their education, build labour force skills, and develop career interests that compete with childbearing within marriage. These career interests may, in turn, motivate women to limit family size and/or widen the spacing of their children (Amin, 1995; Jensen and Thornton, 2003).

Young men who marry early are not always prepared for the responsibilities and stress that sometimes come with marriage. The risk of getting married too young often ends in divorce. Problems associated with men who marry too early include financial instability which they often do not reach until their late twenties or early thirties. Another risk of a man marrying too young is realizing at later age that he did not have the chance to gain life experience. He may decide he wants to have these experiences after he is married, when it is no longer appropriate. If a man marries too early, there is a chance he is not matured enough to handle the challenges and difficulties that can happen in a marriage. (Cee Donohue, 2010).

Increases in age at marriage have been known to be associated with major social-structural changes such as increase in educational attainment, urbanization, and the emergence of new roles for single women (United Nations, 1987, 1988, 1990; Lesthaeghe et al., 1989, Kaufman and Meekers, 1998). Jejeebhoy (1995) found that education is the single factor most strongly related to the postponement of marriage, but the relationship may be subject to threshold effects.

Age at marriage is one of the most important factors in population dynamics as it affects fertility, mortality and migration (Martins, 2011). The preceding paragraphs have attempted to demonstrate that changes in the age at marriage for both men and women which have long been considered an important component of the development process. It is argued that by delaying marriage, both men and women may stay in school longer, find more suitable mates, gain greater bargaining power and push the age of childbearing upward resulting in better child outcomes, fewer births and slower population growth.

According to Inter-African Committee (I.A.C) on traditional practices affecting the health of women and children, "any marriage carried out below 18 years, before the girl is physically, physiologically and psychologically ready to shoulder responsibilities of marriage and child bearing is considered as early marriage" (UNICEF, 2001). For men, as a rule, marriage between twenty and twenty-four years of age may be considered early (www.eldandsold.com/articles08/marriage-4.shtml). These are the qualities that can determine her suitability for marriage, to whom, where and how she is to be married. At age 18 to 24, a girl is known to be matured enough to form a family. She has passed her youthful threshold. If by this age, a young girl is not yet married or is not being courted for marriage, the parents become apprehensive. The woman herself will be desperate and

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begin to experiment on pre-nuptial sex, become pregnant or elope with any suitor who offers the hope of marriage. (Bala et al, 2012)

2.0 MATERIALS AND METHODS

2.1 Data

The data used for this study were extracted from the 2005 National HIV/AIDS and Reproductive Health Survey (NARHS). The study consists of men and women aged 15-49 years and men 15-64 years who ever married. NARHS is a nationally representative survey in Nigeria, which cut across the 36 states and the Federal capital territory. The question "How old were you when you first married or started living with sexual partner" was asked from the respondents during the survey and their ages at first marriage were recorded to the nearest years and this has been used as the response variable in this study.

2.2 Description of the variables used in the study

The dependent variable for this analysis, age at first marriage is a continuous variable. However for the purposes of this study, it was classified into three non-overlapping categories. Since age range considered for early and late marriage for both male and female are different, different thresholds were used for the categorization.

The main interest of this study is to examine the relationship between age at first marriage and some factors thought to be influential. The following Six (6) independent variables or factors were considered.

Zone

Region of residence is identified as the geo-political zone in which the respondent was interviewed. The zones includes: Northwest, Northeast, North-central, Southwest, Southeast and South-south with North-central as the baseline category being the zone middle of northern and the southern part of the country.

Location of Residence

Location of residence of individual is either rural or urban areas. Urban is used as the baseline category

Religion

The religion of respondents is categorised into: Islam and Christian religion. Islam religion is used as the baseline category.

Highest Education Level Attained

The highest levels of education attained are classified as: koranic, primary, secondary and higher education. Primary education has been chosen as the baseline category.

Age at Sexual Initiation

This is the age at which the respondent first experienced sexual intercourse. It is treated as a continuous variable.

Status of Circumcision

The status for circumcision is either yes (circumcised) and no (not circumcised). Yes is chosen as the reference category.

2.3 MULTINOMIAL LOGIT MODEL

Whenever a response variable follows a multinomial distribution, its relationship with a set of explanatory variables can be investigated using logit link as a class of generalised linear models. Fitting a multinomial logit model when all the explanatory variables are categorical is equivalent to fitting a log-linear model for a multi-way contingency table (Agresti, 1990).

Suppose Y is a categorical response variable with J -categories, the multinomial logit model for nominal response variables simultaneously describes log odds for all $J-1$ pairs of categories.

Let $\pi_j = \Pr[Y = j / X]$ at a fixed setting of vector of explanatory variable $X = [X_1, X_2, \dots, X_p]$.

$$\text{The model, } \log\left(\frac{\pi_j}{\pi_J}\right) = \beta_0 + \beta_j X, j = 1, \dots, J-1, \quad (1)$$

(Agresti, 1996) where J is the baseline category, simultaneously describes the effect of X 's on these $J-1$ logits. The effect varies according to the response paired with the baseline. Then the logit model pairs each response category with the base category (Agresti, 1996). Suppose the last category is chosen as the base category, then we need to fit $J-1$ models i.e

$$\log\left(\frac{\pi_j}{\pi_J}\right) = \beta_{j0} + \beta_{j1} X_1 + \dots + \beta_{jp} X_p, j = 1, \dots, J-1 \quad (2)$$

The $J-1$ equations above are then fitted simultaneously to obtain the estimates of all regression coefficients.

2.4 Model Parameters Estimation

The maximum likelihood (ML) in fitting the multinomial logit model maximizes the log likelihood function for the n individuals.

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For $i=1, \dots, n$, let $y_i = (y_{i1}, \dots, y_{iJ})$ represent the multinomial trial for subject i

$$y_{ij} = \begin{cases} 1 & \text{if response of } i\text{th individual is in category } j \\ 0 & \text{if otherwise} \end{cases} \quad (3)$$

Let $X_i = (X_{i1}, \dots, X_{ip})$ denote explanatory variable value for subject i and $\beta_j = (\beta_{j1}, \dots, \beta_{jp})$ denote parameters for the j th logit.

Since $\pi_j = 1 - (\pi_1 + \dots + \pi_{j-1})$ and $y_{ij} = 1 - (y_{i1} + \dots + y_{i,j-1})$, the contribution to the log likelihood by subject i is

$$\begin{aligned} \log \left[\prod_{j=1}^J \pi_j^{y_{ij}} \right]^{J-1} &= \sum_{j=1}^{J-1} y_{ij} \log \pi_j + \left(1 - \sum_{j=1}^{J-1} y_{ij} \right) \log \left(1 - \sum_{j=1}^{J-1} \pi_j \right) \\ &= \sum_{j=1}^{J-1} y_{ij} \log \frac{\pi_j}{1 - \sum_{j=1}^{J-1} \pi_j} + \log \left(1 - \sum_{j=1}^{J-1} \pi_j \right) \end{aligned}$$

Suppose we write (1) as

$$\log \left(\frac{\pi_j}{\pi_J} \right) = \beta_{j0} + \beta_j' X_i, \quad j=1, \dots, J-1 \quad (4)$$

So that

$$\pi_j = \frac{1}{1 + \sum_{j=1}^{J-1} \exp(\beta_{j0} + \beta_j' X_i)} \quad (5)$$

And we assume n independent observations, then, the log likelihood can be given by

$$\log \prod_{i=1}^n \left(\prod_{j=1}^J \pi_j^{y_{ij}} \right) = \sum_{j=1}^{J-1} \left\{ \sum_{i=1}^n y_{ij} (\beta_{j0} + \beta_j' X_i) - \log \left[1 + \sum_{j=1}^{J-1} \exp(\beta_{j0} + \beta_j' X_i) \right] \right\}$$

In an attempt to obtain the maximum likelihood estimates (henceforth referred to as MLE) of the parameters, the log-likelihood is concave and only iterative procedure such

as Newton-Raphson will provide the desire estimates. Often, the sparseness of data adversely affects the behaviour of chi-square test as a goodness-of-fit.

3.0 ANALYSIS OF AGE AT FIRST MARRIAGE

Ages at first marriage was grouped into three non-overlapping nominal categories in this study. Different age grouping was used for men and women because the age considered as early marriage for men is not the same as that of women. The demographic For men, marriage at an age less than 22 years may be considered early (see www.olderandsold.com/articles08/marriage-4.shtml). The categorization for male is

$$j = \begin{cases} 1 & \text{for age} < 22 \text{ years} \\ 2 & \text{for age } 22 - 30 \text{ years} \\ 3 & \text{for age} > 30 \text{ years} \end{cases}$$

where $j=1$ as the baseline category

The legal minimum age at marriage for female is 18 years (UNICEF, 2001). However, at age 18 to 24, a girl is known to be matured enough to form a family (Bala et al, 2012). Thus, the categorization for female is

$$j = \begin{cases} 1 & \text{for age} < 18 \text{ years} \\ 2 & \text{for age } 18 - 24 \text{ years} \\ 3 & \text{for age} > 24 \text{ years} \end{cases}$$

where $j=1$ as the baseline category

Consequently, we define

$$y_{ij} = \begin{cases} 1 & \text{if the } i\text{th individual is in age group } j, j = 2,3 \\ 0 & \text{if the } i\text{th individual is in age group } j, j = 1 \end{cases}$$

where age group 0 is the baseline category

The model estimated was

$$\ln\left(\frac{\pi_j}{\pi_0}\right) = \beta_{j0} + \beta_{j1}north_east + \beta_{j2}north_west + \beta_{j3}south_east + \beta_{j4}south_south + \beta_{j5}south_west + \beta_{j6}korania + \beta_{j7}secondary + \beta_{j8}higher + \beta_{j9}christianity + \beta_{j10}urban + \beta_{j11}nocircum + \beta_{j12}ageatsex$$

$j = 2, 3$

4.0 RESULTS

The results of the multinomial logistic regression are shown in tables 1 and 2 for men and women respectively.

Zone: From Table 1, geographical zone is seen to have a significant effect on the age at first marriage among Nigeria men. Using age category below 22 years as the reference category, the odd that men from North-east and North-west marry at age interval 22-30 years versus marrying at age less than 22 years decreased by 61.17% and 72.77% respectively compared to men from the North-central zone while the odd that men from South-south and South-west marry at age interval 22-30 years compared to marrying at age less than 22 years is 1.84 and 3.16 times those of men from North-central zone. North-eastern and North-western men are more likely to marry at an age less than 22 years compared with men from the North-central zone while South-south and South-west men are more likely to marry at age interval 22-30 years than marrying at an age less than 22 years.

For ages later than 30 years versus those below 22 years, the odd that North-eastern and North-western men marry at an age later than 30 years decreased by 85.35% and 88.40% respectively while South-eastern, South-south and South-western men are 3.30, 3.30 and 5 times more likely to marry at an age later than 30 years compared with men from North-central zone of the country. In the two comparisons, men from the North-east and North-west are more likely to marry at an age less than 22 years while men from the South-east, South-south and South-west are more likely to marry at an age later than 30 years compared to other age groups.

For women as presented in Table 2, using age category below 18 years as the reference category, the odd that North-western women will marry at age 18-24 years decreased by 60.06% compared with women from the North-central while the odd that South-south and South-west women will marry at age interval 18-24 years is 4.76 and 4.15 times those of women from the North central zone. The result for age later than 24 years versus age less than 18 years reveals that the odd of women from the North-west marrying at an age later than 24 years decreased by 92.74% while the odd that South-south and South-west women will marry at an age later than 24 years is 4.91 and 3.94 times that of their female counterpart from the North-central. Women from the North-west are less likely to

marry at an age later than 18 years than other age groups, women from the South-south are more likely to marry at an age later than 24 years than any other age groups, but women from the South-west are more likely to marry at age interval 18-24 years because of marrying at age later than 24 years reduced.

Table 1. Results of multinomial logistic regression for men showing estimated Odds Ratios and P-values using age category below 22 years as the reference category.

Independent variables	22-30 years		>30 years	
	Odds ratio	P- Value	Odds ratio	P- Value
ZONE				
North-west	0.3883	<0.001	0.1465	<0.001
North east	0.2723	<0.001	0.1160	<0.001
South east	1.8688*	0.056	3.3038	0.004
South-south	1.8362	0.021	3.3004	<0.001
South west	3.1598	<0.001	5.0127	<0.001
HIGHEST EDUCATION ATTAINED				
Koranic	0.7363*	0.104	0.8178*	0.646
Secondary	1.9255	<0.001	2.1865	<0.001
Higher	2.0082	0.003	3.4738	<0.001
RELIGION				
Christianity	1.5415	0.033	3.5359	<0.001
LOCATION				
Urban	1.6715	<0.001	2.6496	<0.001
CIRCUMCISION STATUS				
No circumcision	0.4429	0.007	0.4911*	0.119
AGE AT FIRST SEX				
Age at sex	1.5191	0.001	1.7692	<0.001

Asterisk (*) indicates the variable that is not statistically significant

Highest education level attained: Men and women with highest education higher than primary education are found to marry at a later age compared with their counterpart with primary education. From the results of the log odd of age interval 22-30 years versus less than 22 years (Table 1), the odd of men with secondary and higher education marrying at age interval 22-30 years are 1.93 and 2.00 times that of men with primary education, while the odd increased to 2.19 and 3.47 times marrying at an age later than 30 years compared with men with primary education respectively from the log odd of an age later than 30 years versus age less than 22 years. Men with higher education are more likely to marry at an age later than 30 years than other age groups while men with secondary education are more likely to marry at age interval 22-30 years compare to any other age groups.

In the case of women, from the log odd of age interval 18-24 years versus less than 18 years, the odd that a woman with either secondary or higher education marries at age interval 18-24 years is 2.41 and 2.52 times that of women with primary education. The

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odd increased to 3.23 and 8.09 times marrying at an age later than 24 years to age less than 18 years when compared with women with primary education.

Religion: Christian men and women are more likely to marry at a later age compared to their Muslim counterpart. Results from the log odd of age interval 22-30 years compared to age less than 22 years show that the odd of Christian men marrying at age interval 22-30 years is 1.54 times that of Muslim men while the odd increased to 3.54 times that of Muslim men for an age later than 30 years when compared with age less than 22 years.

Also, the log odd of age later than 24 years and less than 18 years shows that the odd of Christian women marrying at age later than 24 years is 3.06 times that of Muslim women. Christian women are more likely to marry at an age later than 24 years than age less than 18 years.

The location of residence: log odd of age interval 22-30 years and less than 22 years show that the odd of men living in the urban areas marrying at age interval 22-30 years compared to age group less than 22 years is 1.76 times that of men living in the rural areas. The odd is 2.65 times that of rural men when an age later than 30 years and less than 22 years is compared. Location was not significant in distinguishing the categories of age at first marriage for women.

Circumcision: In the case of women, from the log odd of age group later than 24 years and less than 18 years, the odd that circumcised women will marry at an age later than 24 years decreased by 56.71% compared with women that are circumcised.

Table 2. Results of multinomial logistic regression for women showing estimated Odds Ratios and P-values using age category below 18 years as the reference category.

Independent variables	18-24 years		>24 years	
	Odds ratio	P- Value	Odds ratio	P- Value
ZONE				
North-west	0.7551*	0.389	0.5824*	0.367
North east	0.3994	0.008	0.0726	0.002
South east	0.9444*	0.885	0.9087*	0.846
South-south	4.7591	<0.001	4.9075	<0.001
South west	4.1582	<0.001	3.9446	<0.001
HIGHEST EDUCATION ATTAINED				
Koranic	0.5238*	0.053	0.3953*	0.400
Secondary	2.4149	<0.001	3.2312	<0.001
Higher	2.5239	0.034	8.0904	<0.001
RELIGION				
Christianity	1.4283*	0.197	3.0616	0.004
LOCATION				
Urban	0.7776*	0.228	1.5174*	0.134
CIRCUMCISION STATUS				

No circumcision	0.5393	0.007	0.4389	0.005
AGE AT FIRST SEX				
Age at sex	3.4804	<0.001	4.7893	<0.001

Asterisk (*) indicates the variable that is not statistically significant

Age at first sex: For both men and women, a delay in the age at which they started having sex defers marriage to a later age. In other words, an increase in the age at which sex is initiated increases the odd of marrying at a later age. As observed, comparing to marrying at age less than 22 years for men, a 1 year increase in age at sexual initiation is associated with 1.5 increase and 1.7 increase in odd of marrying within age range 22-30 years and age above 30 years respectively. For women, comparing to marrying at age less than 18 years, a 1 year increase in age at sexual initiation is associated with 1.5 increase in the odd of marrying within age range 18-24 years and 1.7 increase in odd of marrying above 24 years of age.

CONCLUSION

From the findings of this research, using North-central as baseline, it was found that early marriage is more predominant among men and women in the North- western zone of the country. Also for educational attainment, an individual who marries at an early age is characterised with low level of education. This study has implication that a compulsory and mandatory minimum of level of education should be imposed by the government and if possible, this level of education should be made free and easily accessible for all. Young people should be educated on the risk of early sexual activity so as to increase the age at marriage. There should be an increase in the age at marriage for both men and women to reduce divorce and rise in single parenting, also the Child Rights Acts passed in 2003, which rose the minimum age of marriage to 18 for girls should be implemented in all the state of the federation, and, the three legal systems operating in Nigeria: Civil, Customary and Islamic should not encourage marriage at an age less than 18 years.

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