

BMJ Open

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Journal:	<i>BMJ Open</i>
Manuscript ID:	bmjopen-2015-008371
Article Type:	Research
Date Submitted by the Author:	01-Apr-2015
Complete List of Authors:	Fagbamigbe, Adeniyi; University of Ibadan, Epidemiology & Medical Statistics Adebowale, Ayo; University of Ibadan,, Epidemiology & Medical Statistics MORHASON-BELLO, Imran; University of Ibadan,, Department of Obstetrics & Gynaecology,
Primary Subject Heading:	Public health
Secondary Subject Heading:	Epidemiology, Reproductive medicine, Public health, Sexual health, Research methods
Keywords:	Contraception, Survival analysis, Nigeria, Women

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Time to uptake of modern contraceptives among sexually active women of reproductive age in Nigeria: Survival analysis approach

***Fagbamigbe, Adeniyi Francis^{1,2}, Adebowale, Ayo Stephen¹, Morhason-Bello, Imran Oludare³**

¹Department of Epidemiology and Medical Statistics, Faculty of Public Health, College of Medicine, University of Ibadan, Nigeria

²School of Research and Postgraduate Studies (SoRPS), HSS, North West University, Mafikeng, South Africa

³Department of Obstetrics and Gynaecology, Faculty of Clinical Sciences, College of Medicine, University of Ibadan/University College Hospital, Nigeria

*** For Correspondence:** *E-mail:* franstel74@yahoo.com *Phone:* +2348061348165 +276020387209

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Abstract

Objective: To assess the timing of Modern Contraceptive (MC) uptake among married and never married women in Nigeria.

Design: A retrospective cross sectional study

Setting: We utilized a nationally representative 2013 DHS data in Nigeria, and MC uptake time was measured as period between first sexual intercourse and first use of MC. Nonusers of MC were censored as of the date of the survey. Kaplan Meier survival curves were used to determine the rate of uptake. Cox-proportional Hazard model was used to determine variables influencing the uptake at 5% significance level.

Participants: Over 33222 sexually active women of reproductive age

Outcome measure: Time of uptake of modern contraceptives after first sexual intercourse

Results: The median MC uptake time was 4 years in never married and 14 years among ever married women. Significant differences in MC uptake existed in respondents' age, location, education and wealth status. Never married women were over ten times more likely to uptake MC than ever married women (aHR=3.24(95%CI:2.82-3.65)). Women with higher education were six times more likely to uptake MC than those without education (aHR=6.18(95%CI:5.15-7.42)).

Conclusion: The rate of MC uptake is low, and timing of contraceptive uptake during or after first sexual intercourse was longer among married than never married women. All women, irrespective of their marital status should be encouraged to use modern contraceptives.

Key words: Marital status, Modern contraceptives uptake, Survival analysis, Women, Nigeria

Strength and Limitation

The strengths of the paper are

- We used a large nationally representative sample to assess duration between time of first sexual activity and time of MC as against the usual factors
- We focused on the global target population with high unmet need for family planning
- We used survival analysis method to determine the time wasted without uptake of MC
- Same analysis could also be performed in other Sub-Saharan African countries since DHS data has international similarity. This would provide opportunity to compare policies and response to MC uptake in the region.

The limitations are

- We relied on recall of participants to determine time of first sexual activity and MC uptake
- It is difficult to give a temporal evidence of explanatory factors considered in the Cox-regression model since the data is cross-sectional.
- We did not use partners' data in the analysis.

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Background

Contraception is regarded as one of the cheapest and effective strategy to promote sound reproductive health¹⁻³. This is why governments and international agencies are making frantic efforts to ensure that individuals within childbearing age have unhindered access to modern contraceptive commodity. The predominantly high fertility rates in developing countries⁴ especially in sub-Saharan Africa is not disconnected from low contraceptive use^{2,5}. The effect of high fertility on women and family is enormous. Apart from maternal depletion syndrome and its attendant problems, contraceptive also prevents unwanted pregnancies, thereby lowering unsafe abortion and maternal mortality. The economic pressure of managing large family size coupled with overwhelming associated health complications of such is a pointer for embracing modern contraception in Nigeria⁶.

The current maternal mortality ratio (MMR) in Nigeria is 576 per 100,000 live births⁷. One in three women give birth before age 20, and also, pregnancy related morbidity and mortality rates are also high among this group. One quarter of the estimated 20 million unsafe abortions and 70,000 abortion related deaths each year occur among women aged 15-19 years. Similarly the risk of dying during childbirth in this age group doubled those aged 20 years and above.⁸. An estimated fourteen million unwanted pregnancies occur yearly, with almost half in women aged 15-24 years in sub-Saharan Africa⁹. In addition, 16% of the currently married women in Nigeria have unmet need for family planning⁷. This is slightly lower than 20% reported in 2008¹⁰. Modern Contraception (MC) is one of the primary prevention of maternal deaths and it could also prevent 90 percent of abortion related morbidity and mortality¹.

Nigeria, the most populous black nation has witnessed sporadic increase in population growth in the last two decades¹¹. In 1990, the population was slightly above 80 million and this has increased to 170 million in 2013¹². Consequently, the high increase in population growth combined with low contraceptive use in Nigeria prompted the Federal Government to institute policies at different times aimed at reducing the population growth rate. For instance, the National Policy on Population for Development was launched in 1988¹³ and was revised in 2004¹⁴. However, a review of the policies identified low use of modern contraceptive as barrier towards its effectiveness¹⁵. The reviewed policy was intended to overcome the shortcomings of the earlier policy and ensure increase in contraceptive use nationwide.

MC uptake in the developing countries is generally lower than developed countries¹⁶. Worldwide, the Contraceptive use Prevalent Rate (CPR) is 56 percent. The CPR in developed countries is 62% while it is 54% in less developed nations and 28% in least developed nations. In Africa, the CPR, is 26% and 20 % in sub-Sahara Africa. Nigeria and her neighbouring

countries have about 10 percent modern contraceptive uptake value⁴. Nigeria has a total fertility rate of 5.6, the growth rate is 2.5% per annum and the CPR is less than 10.0%^{7,11}.

Previous studies have identified socio-demographic differentials in contraceptive use. Among factors identified in these studies are age at first sexual intercourse, religion, education, place of residence, and economic status^{2,5,7,17}. The reproductive choices of young adults has also been found to have a great impact on their schooling, health and ultimately, transition to adulthood^{18,19}. In particular, early child bearing has been attributed to higher rates of maternal and child mortality, truncated education, larger family sizes, which in turn, lead to increase in population²⁰.

Knowledge of family planning methods is 85% but the uptake is less than 15%^{7,21}. The most common MC among women are the pill (71%), injectables (68%), and the male condom (67%) whereas male condom (91%), the pill (65%), and injectables (60%) are the most common methods among men. While 15% of currently married women use any method of contraception, only 10% use a modern method of family planning⁷. The reasons why high knowledge of family planning methods has failed to translate to high uptake remain a great concern to government and researchers in Nigeria.

In Nigeria, the national surveys have revealed that median timing of first sexual intercourse is below 18 years^{7,21}. This is the age when adolescents are most susceptible to sexually transmitted infections including HIV/AIDS and human papillomavirus, and other health complications. Unfortunately, in Nigeria context, cultural beliefs do not support discussion on reproductive issues including the use of MC among young individuals². People see young women who demand for contraceptive as promiscuous and as a result they either not use or rely on their male sexual partners who may be older or their peers²¹. Where such provisions are not available, young women have sex without the use of any contraception or make use of traditional method which is often not effective³. Thus teenage pregnancy, early marriage or single parenthood may be the end result. Due to shame attached to premarital pregnancy in Nigeria, unmarried women are expected to protect themselves from such embarrassment³. Equally, the married are expected to use modern contraceptive to guard against unwanted pregnancies in marriage^{22,23}. In this regard, we argue that the timing of uptake of modern contraceptive might be different among women in marital union and those never married. This differential in timing of contraceptive uptake by marital status is yet to be adequately documented in Nigeria.

Literature is replete on the prevalence and factors influencing contraceptive use but there is little or no robust analysis on time to uptake of modern contraceptives among sexually active women at the national level in Nigeria. This study was designed to model the time it takes sexually active women in Nigeria to begin the use of modern contraceptives after the first sexual experience, and also, to identify factors influencing the uptake. The objectives were conceived

with the view to provide information that will enhance the existing frameworks on family planning in Nigeria.

Methods:

We used the data collected during the 2013 Nigeria Demographic and Health Survey (NDHS). The sample was nationally representative that covered the entire population residing in non-institutional dwelling units in the country. The survey used the list of enumeration areas (EAs) prepared for the 2006 Population Census in Nigeria as a sampling frame. This was provided by the National Population Commission. The sample was designed to provide population and health indicator estimates at the national, zonal, and state levels. The sample design allowed for specific indicators to be calculated for each of the six zones, 36 states, and the Federal Capital Territory, Abuja.

Administratively, Nigeria is divided into 36 states and Federal Capital territory (Abuja). Each state is subdivided into local government areas (LGAs), and each LGA is divided into localities. There are 774 LGAs in the country. In addition to these administrative units, during the 2006 population census, each locality was subdivided into census enumeration areas. The primary sampling unit (PSU), referred to as a cluster in the 2013 NDHS, is defined on the basis of EAs from the 2006 EA census frame. The 2013 NDHS sample was selected using a stratified three-stage cluster design consisting of 904 clusters, 372 in urban areas and 532 in rural areas. A representative sample of 40,680 households was selected for the survey, with a minimum target of 943 completed interviews per state. A fixed sample take of 45 households were selected per cluster. All women age 15-49 who were either permanent residents of the households in the 2013 NDHS sample or visitors present in the households on the night before the survey were eligible and were interviewed. A total of 39,902 women age 15-49 were identified as eligible for individual interviews, and 98 percent of them were successfully interviewed.

Among others, the women were asked questions on their background characteristics (age, religion, education, literacy, media exposure, etc.), reproductive history and childhood mortality, knowledge, source, and use of family planning methods. Time to uptake of MC since first sexual intercourse (sexual initiation) was used as dependent variable. Age, region, education, religion, residence, husbands' education, children everborn, wealth status and marital status were independent variables. The time to uptake of MC was computed as the time (years) difference of current age (v012) and age at first sexual intercourse (v531) for nonusers and censored accordingly. For respondents using MC, the time to uptake of MC was computed as time difference between year of uptake of MC and age at sexual initiation. Women who never had sexual intercourse were excluded from the study.

Time to MC uptake was modeled using a discrete-time duration model. The survival time is assumed to begin at the time a woman had her first sexual intercourse until the time she started

using modern contraceptives. The survival time is censored for sexually active women who has never used MC as of the time of the survey. The duration from first sexual intercourse to MC uptake, “T”, is assumed to be a discrete random variable that takes on only positive integer. The populations at risk are all sexually active women involved in the study. The observation continues until time “t”, at which the event of interest, uptake of MC, occurs or the time to the end of the study when observation is censored in 2013, the year of the survey, if the individual has not uptake MC. The study ends for an individual at time “T = t” if she had started using MC. Two quantitative terms were used in this study. These are; the survivor function S(t) and hazard function h(t). The survivor function gives the probability that a person survives longer than some specified time t without uptaking MC, while the hazard function gives the instantaneous potential per unit time for MC to be uptaken, given that the individual MC uptaking time survived up to time t. Survival and hazard function are mathematically denoted by

$$S(t(j-1)) = \prod_{i=1}^{j-1} P(T > t_{(i)} | T \geq t_{(i)}) \dots\dots\dots (1)$$

and

$$h(t) = \frac{P(t \leq T < t + \Delta t | T \geq t)}{\Delta t} \dots\dots\dots (2)$$

respectively.

The Cox-proportional Hazard model was used to predict the strength of the relationship between each the selected independent variables and censored timing of MC uptake.

The Cox model is usually in terms of hazard model which gives an expression for the hazard at time t for an individual with a given specification of a set of independent denoted by “X” which are predictor variables that is being modeled to predict individuals’ hazard. The Cox proportional hazards regression assumes the relationship for one covariate where ho(t) is the baseline hazard function, xi are the covariates and βi are the coefficients.

$$h(t, x) = h_0(t) \exp(x\beta) \dots\dots\dots (3)$$

We also stratified Cox regression estimates. In the stratified estimator, the hazard at time t for a subject in group i is assumed to be

$$h_i(t) = h_{i0}(t) \exp(\beta_1 x_{i1} + \dots + \beta_k x_{ik}) \dots\dots\dots (4)$$

That is, the coefficients are assumed to be the same, regardless of group, but the baseline hazard can be group specific. In our stratified Cox analysis, we tested whether the proportional-hazards assumption was violated using the significance of the hazard ratios and the Wald chi square statistics. Variables significant in the bivariate cox regression were used in the multiple cox regression to assess association with outcome variable while controlling for confounders.

Sampling weights were applied in our analysis. The weighting was based on the sampling fractions derived from the sample size and the total population of each state constituting Nigeria. Statistical significance was determined at $p\text{-value} = 0.05$. We used the STATA (version 13) statistical analysis software for the analysis.

Ethical Approval:

Ethical approval was sought from Nigeria National Health Research Ethics Committee by the data originators and granted before the commencement of the survey. Also, informed consents were received from the participants before responding to questions used during the survey. We obtained the approval from measure DHS for permission to use the data prior to analysis.

Results

Of the 38,948 respondents, 85.3% had had sex. Mean age of sexual debut was 14.31 (95% CI = 14.24-14.38) with a range of 8-46 years. About three fifths (57.9%) of the respondents were from rural areas, 37.8% had no education, 20.1%, 17.4% and 18.3% aged 15-19, 20-24 and 25-29 years respectively. Only 42.6% of respondents aged 15-19 years had had sex. Only 11.4% of the sexually active respondents were currently using MC. Highest use of MC was found among respondents aged 20-24 years, 27.2% in the South West, 16.8% in urban areas 26.5% among respondents with higher educational attainment 18.7% among women in richest wealth quintiles, 15.8% among never married and 9.9 % among ever married women. The median year to uptake of MC was 4 years, 14 years and 13 years among the never married women, ever married women and all sexually active women respectively.

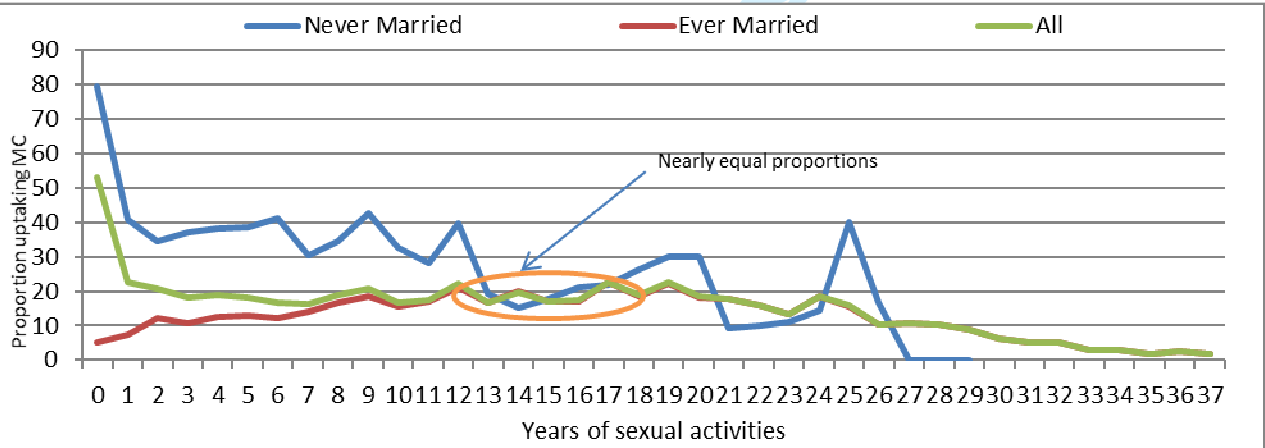
Table 1: Distribution of respondents by socio-demographic characteristics, sexual activities, MC use and median year to uptake of MC

Variable	Category	N=38948 (%)	% who had ever had sex	% using MC among SAW	Median time of up taking MC		
					Never Married Women	Ever Married Women	Both
Age Group	15-19	20.1	42.6	12.7	2	3	2
	20-24	17.4	86.6	16.0	3	6	5
	25-29	18.3	97.0	13.2	6	10	10
	30-39	14.0	99.2	13.6	12	17	16
	40-49	12.1	99.8	11.2	22	27	27
Region	North Central	14.3	81.7	16.5	3	12	11
	North East	14.8	88.4	3.8	3	14	13
	North West	30.5	90.3	3.3	3	14	14
	South East	11.5	78.7	17.9	3	15	13
	South South	12.7	84.4	21.9	4	15	12
Residence	South West	16.2	83.1	27.2	3	14	12
	Urban	42.1	80.3	20.9	4	14	12
Wealth Index	Rural	57.9	85.3	8.8	3	14	13
	Poorest	18.7	91.3	3.2	3	14	14
Highest	Middle	19.2	83.7	12.6	3	14	13
	Richest	21.6	81.0	23.3	4	13	12
No education	No education	37.8	95.9	2.0	4	15	15

Education Level	Primary	17.3	91.5	13.2	4	16	15
	Secondary	35.8	71.3	22.7	3	11	9
	Higher	9.1	88.0	30.1	5	12	10
Husband's Highest Educ Level	No education	38.8	100.0	2.1	na	15	15
	Primary	18.4	100.0	10.9	na	15	15
	Secondary	28.1	100.0	14.7	na	12	12
Religion	Higher	13.7	100.0	18.9	na	13	13
	Catholic	11.1	80.1	20.9	4	14	12
	Other Xtian	35.7	82.6	21.8	4	14	12
Marital status	Islam	51.7	88.5	5.3	2	13	13
	Traditionalist	0.9	90.3	4.7	3	18	18
	Never Married	23.9	41.6	38.0	4	na	4
Children Ever born	Ever Married	76.1	100.0	9.9	na	14	14
	No Birth	29.1	50.0	24.4	3	3	3
	1-2 Births	21.9	100.0	10.1	5	6	6
	3-4 Births	19.7	100.0	13.0	13	12	12
	>4 Births	29.3	100.0	10.4	19	21	21
Total	Total	100.0	85.3	13.3	4	14	13

At the year of sexual initiation 79.4% of never married women and 5.2% of ever married women used MC; 40.6% versus 7.3% during the second year; and 34.4% versus 12.0% during third year etc. The proportion fell among never married women as the year from sexual initiation increased but it rose gently among ever married women to its peak at about 17th year of sexual activities where it remain the same without overall proportion of MC users among all women. Proportions using MC within each group were about the same between the 12th and 17th year of sexual activities (Figure 1).

Figure 1: Proportions of sexually active women up-taking MC by years of sexual activities and marital status



Over two fifths (41.5%) of the MC users were currently using male condoms, 22.3% used Injections, 17.2% were on pills, 6.9% on IUD while less than one percent each used Female condoms, diaphragm, foam, and male sterilization (data not shown). In Figure 2, we compared

the rate of MC uptake among sexually active women by marital status. The rate of MC uptake among the never married women was higher than among ever married women.

Figure 2: Survival analysis of MC uptake among all respondents by Marital Status

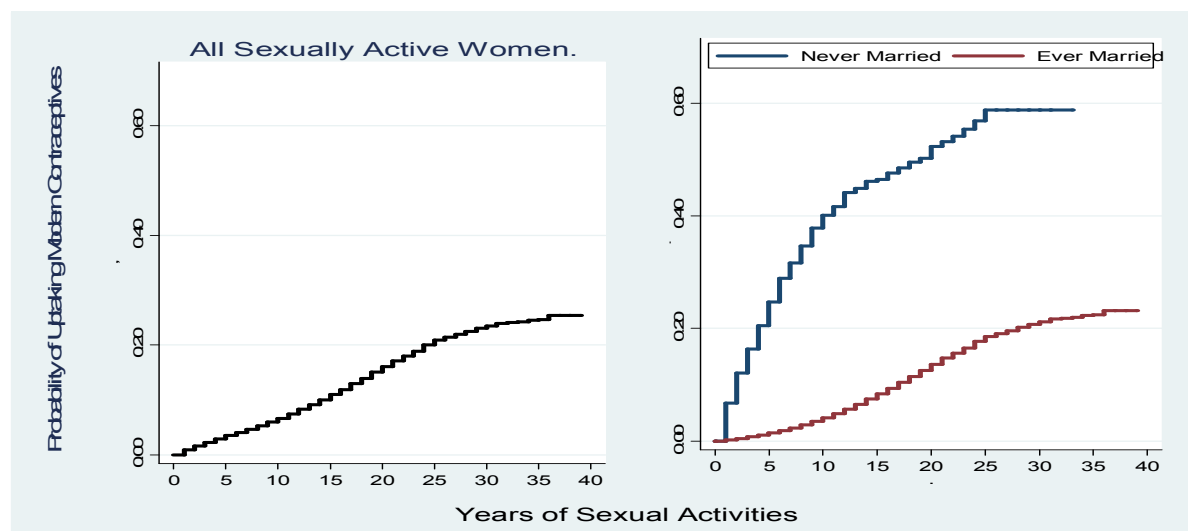
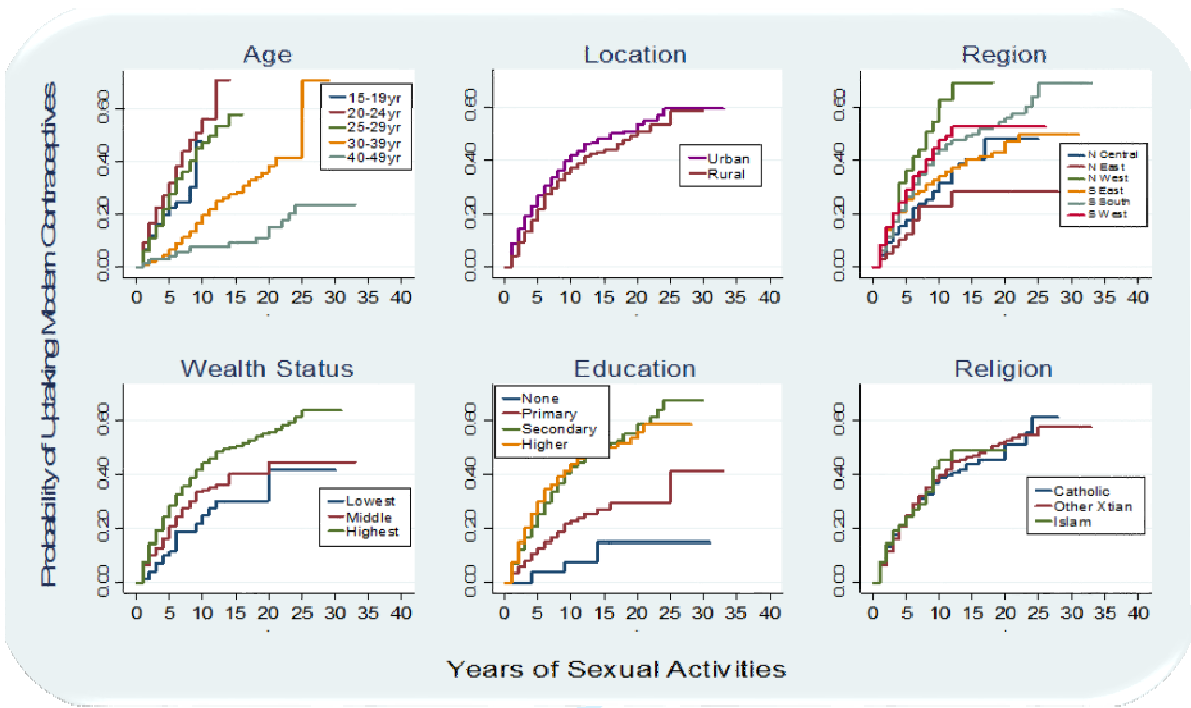


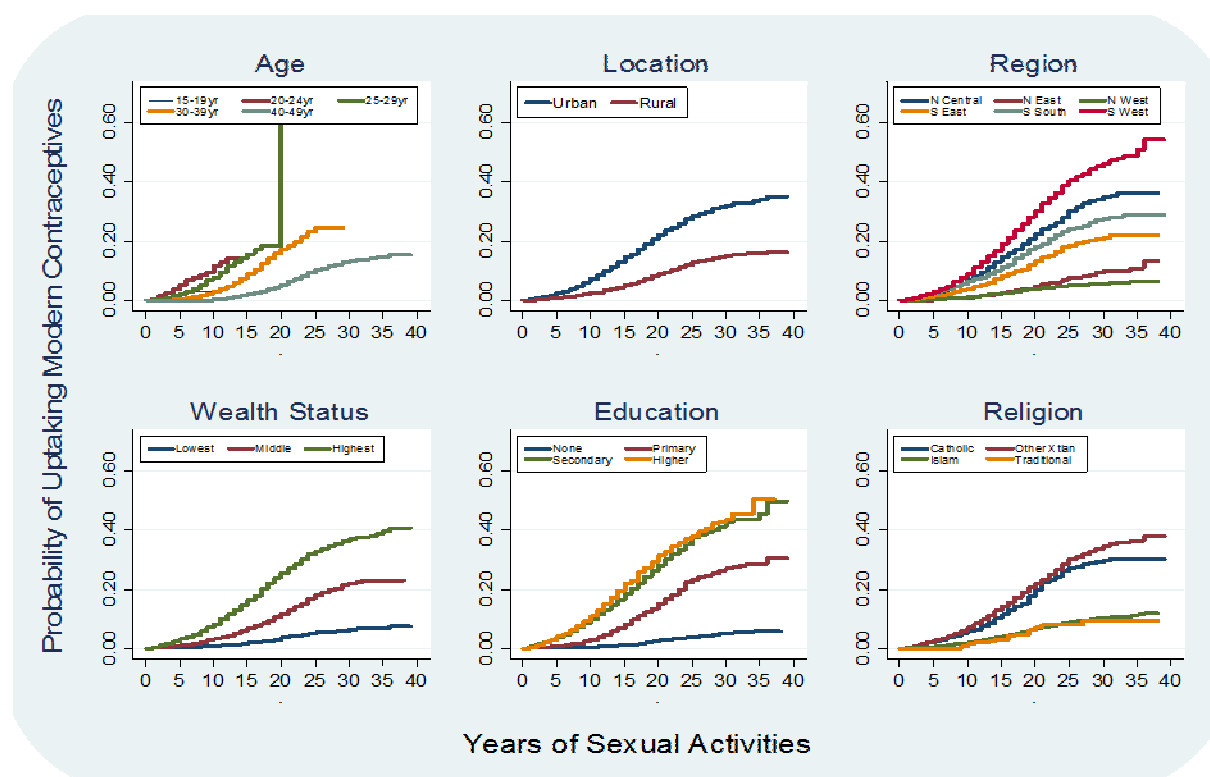
Figure 3 shows the probabilities of MC uptake among the never married women according to their socio-demographic characteristics. Considering age, never married women aged 20-24 years had higher chances than other never married women to uptake MC as they progressed in the years of sexual activities. Similarly, never married women in urban areas and within the highest wealth quintiles had highest probabilities of uptaking MC.

Figure 3: Probabilities of MC uptake among Never married women according to some selected socio-demographic characteristics



In Figure 4, the probabilities of MC uptake among the ever married women according to their socio-demographic characteristics were shown. Ever married women in the South West region had highest likelihood of up taking MC than ever married women from other regions as they progressed in their years of sexual activities. Also, ever married women who were either Catholics or practicing other Christian faith had higher probability of MC uptake than other ever married women as years of sexual activities progresses.

Figure 4: Probabilities of MC uptake among Ever married women according to some selected socio-demographic characteristics



The unadjusted hazard ratio showed that chances of a never married woman to uptake MC reduced by 7% for every additional year after sexual initiation. Those aged 20-24 years are 42% more likely to uptake MC than never married women aged 15-19 years (HR=1.42(95% CI: 1.14-1.77)). Never married women from North East zone were 31% times less likely to uptake MC than their counterparts from North Central (HR=0.69 (95% CI: 0.45-1.04)). On wealth status, never married women in richest wealth quintile are more over twice likely to uptake MC than never married women in poorest wealth quintile while those in having secondary (HR=7.14 (95% CI: 2.67-19.11) or higher (HR=7.88(95% CI: 2.93-21.16) education were over seven times more likely to uptake MC than those without any formal education (Table 2). Among the ever married women, those from south west were about 40% more likely to uptake MC than those from the North Central (HR=1.42(95% CI:1.25-1.58)) and over 80% times less likely in the North East (HR=0.20 (95% CI:0.17-0.24)).

In the multivariate analysis, the adjusted hazard ratio shows that never married woman aged 20-24 years to uptake was 31% higher than a never married woman aged 15-19 years (aHR=1.31(95% CI:1.05-1.63)) while never married woman with 1 or 2 births were 22% times

less likely to uptake MC than those with no previous birth (aHR=0.78(95% CI: 0.65-0.93)). Ever married women who practiced Islam were 42% times less likely to uptake MC compared with their counterparts in Catholic religion (aHR=0.58 (95% CI:0.49-0.67)). After controlling for other variables a sexually active woman with higher education in Nigeria were six times more likely to uptake MC than those without any formal education(aHR=6.18(95% CI:5.15-7.42)) just as rural women were 17% less likely to uptake MC than the urban sexually active women (aHR=0.83(95% CI: 0.76-0.90).

Table 2: Determinants of MC uptake among Never married and ever married women

Variable	Categories	Bivariate analysis of determinants of MC uptake			Multiple analysis of determinants of MC uptake		
		Never Married HR(95% CI)	Ever Married HR(95% CI)	Both HR(95% CI)	Never Married HR(95% CI)	Ever Married HR(95% CI)	Both HR(95% CI)
Marital Status	Never Married			10.1(9.2-11.0)*			3.21(2.82-3.64)*
	Ever Married			Reference			Reference
Age(years)+		0.93(0.92-0.94)*	0.89(0.88-0.90)*	0.88(0.87-0.88)*	0.91(0.89-0.92)*	0.84(0.83-0.85)*	0.84(0.83-0.85)*
Age Group	15-19	Reference					
	20-24	1.42(1.14-1.77)*	1.40(0.94-2.10)	0.99(0.82-1.20)	1.31(1.05-1.63)*	0.75(0.50-1.12)	0.94(0.78-1.14)
	25-29	1.08(0.86-1.37)	0.68(0.45-1.01)	0.46(0.38-0.55)*	0.89(0.70-1.14)	0.26(0.17-0.38)*	0.38(0.31-0.46)*
	30-39	0.37(0.27-0.50)*	0.29(0.19-0.43)*	0.16(0.13-0.19)*	0.28(0.20-0.39)*	0.08(0.05-0.12)*	0.11(0.09-0.13)*
	40-49	0.12(0.06-0.25)*	0.10(0.06-0.14)*	0.05(0.04-0.06)*	0.10(0.05-0.20)*	0.02(0.01-0.03)*	0.03(0.02-0.04)*
Region	North Central	Reference					
	North East	0.69(0.45-1.04)	0.20(0.17-0.24)*	0.22(0.18-0.25)*	0.86(0.56-1.31)	0.41(0.34-0.49)*	0.46(0.39-0.54)*
	North West	2.04(1.38-3.03)*	0.15(0.13-0.18)*	0.16(0.14-0.19)*	2.49(1.67-3.71)*	0.4(0.33-0.47)*	0.47(0.40-0.55)*
	South East	1.22(0.94-1.57)	0.56(0.49-0.65)*	0.80(0.70-0.90)*	1.47(1.12-1.92)*	0.39(0.34-0.46)*	0.55(0.48-0.62)*
	South South	1.43(1.14-1.80)*	0.80(0.71-0.90)*	1.11(1.00-1.23)*	1.58(1.24-2.02)*	0.49(0.43-0.56)*	0.68(0.61-0.75)*
	South West	1.61(1.25-2.07)*	1.42(1.28-1.58)*	1.47(1.34-1.62)	1.41(1.08-1.83)*	0.94(0.84-1.05)	1.06(0.95-1.17)
Residence	Urban	Reference					
	Rural	0.80(0.69-0.92)*	0.38(0.35-0.41)*	0.39(0.37-0.42)*	0.97(0.83-1.14)	0.8(0.73-0.88)*	0.83(0.76-0.90)*
Wealth	Poorest	Reference					
Index	Middle	1.7(1.23-2.35)*	3.69(3.19-4.28)*	4.00(3.50-4.57)*	1.41(1.01-1.97)*	1.72(1.47-2.02)*	1.71(1.49-1.98)*
	Richest	2.4(1.79-3.21)*	8.09(7.14-9.17)*	8.52(7.60-9.56)*	1.84(1.33-2.54)*	2.32(1.98-2.71)*	2.19(1.90-2.53)*
Highest	No education	Reference					
Education	Primary	3.36(1.21-9.33)*	6.39(5.51-7.40)*	6.59(5.70-7.62)*	2.88(1.03-8.03)*	3.17(2.69-3.74)*	3.29(2.80-3.87)*
	Secondary	7.14(2.67-19.1)*	13.1(11.4-15.1)*	15.8(13.8-18.1)*	4.47(1.66-12.1)*	4.46(3.76-5.29)*	4.90(4.16-5.78)*
	Higher	7.88(2.93-21.2)*	14.4(12.3-16.8)*	18.9(16.3-21.9)*	5.46(2.00-14.9)*	5.57(4.59-6.76)*	6.18(5.15-7.42)*
Religion	Catholic	Reference					
	Other Xtian	1.01(0.85-1.21)	1.18(1.05-1.33)*	1.11(1.00-1.22)*	0.95(0.79-1.15)	0.93(0.82-1.05)	0.94(0.85-1.05)
	Islam	1.09(0.81-1.46)	0.31(0.28-0.36)*	0.25(0.22-0.28)*	1.14(0.83-1.56)	0.58(0.49-0.67)*	0.60(0.52-0.69)*
	Traditionalist	0.96(0.13-6.85)	0.28(0.16-0.48)*	0.23(0.14-0.38)*	0.74(0.10-5.36)	0.67(0.39-1.15)	0.67(0.40-1.12)
Children	No Birth	Reference					
Ever born	1- 2 Births	0.73(0.61-0.86)*	5.48(3.80-7.91)*	0.47(0.42-0.52)*	0.78(0.65-0.93)*	3.46(2.40-4.99)*	0.58(0.52-0.65)*
	3- 4 Births	0.31(0.15-0.66)*	3.72(2.58-5.35)*	0.30(0.27-0.34)*	0.49(0.23-1.04)	3.58(2.48-5.17)*	0.60(0.53-0.68)*
	>4 Births	0.15(0.02-1.08)	1.43(0.99-2.06)	0.13(0.11-0.14)*	0.48(0.07-3.56)	3.40(2.35-4.93)*	0.60(0.52-0.68)*

* Significant at 5% p-value +treated as continuous variable HR Hazard Rate aHR adjusted Hazard Rate CI Confidence Interval MC Modern

Discussion

Modern contraceptive is an effective method to prevent unplanned pregnancy and other associated health complications of unprotected sexual activity²⁴. Uptake of modern contraceptive method is often measured and compared across different settings, and it is sometimes used as proxy indicator for burden of unprotected sexual activity and unplanned pregnancy²⁵. In this study, the average national modern contraceptive uptake among sexually active women was 11.4 percent. The uptake is highest among those aged 20 to 24 years, resident in southwest, living in urban community, and with highest education and wealth quintiles. The shortest interval to uptake modern contraception was four years after initiation of sexual activity, and this was understandably among never married women. This interval is more than 3 times shorter than the ever married women. The proportionate trend of those that used modern contraception by unit change of year from point of sexual initiation nosedive in the never married women, and thereafter plateau after 17 years. On the contrary, there was a steady rise among the ever married till 17 years after sexual initiation. Both groups however had similar proportion of contraceptive uptake at 17 years after sexual initiation.

The general low level of modern contraceptive uptake in Nigeria remained a source of concern especially among the sexually active women. Though the average uptake now is marginally higher than 2008 DHS¹⁰ but this is not commensurate with the investment on family planning in the country within the period¹⁰. Unlike the previous published articles on modern contraception in Nigeria, this analysis modelled time interval between sexual initiation and uptake of contraception using a nationally representative data.

The lessons derivable are in manifold. First, there is a lag period of at least four years averagely before access to modern contraception among sexually active women in Nigeria. This could possibly be due to either lack of awareness or access to contraceptive commodities and its services. Second, age long factors such as regional variations, urban-rural divide, wealth indices, and education that had been associated with uptake of modern contraception; are still significant in this analysis^{22,23,26}. The low contraceptive uptake in Northern Nigeria is responsible for a comparative upsurge in several family planning interventions in this region than others²⁷. Despite this effort, Southern regions still have a higher modern contraception uptake among the sexually active women. The known associated factors responsible for the poor uptake in Northern Nigeria are education, socio-cultural disposition and interpretation of modern contraception^{28,29}. Some have argued that Northern regions of the country still have a conservative disposition towards modern contraceptive methods of family planning²⁸. This was buttressed with an evidence of a fairly higher awareness of family planning and use of traditional or unorthodox methods and high fertility rates among women in the north²⁷.

Another interesting finding is that some factors that are associated with the probability of modern contraceptive uptake differed by marital status. Women aged 20 – 24 were 31 percent more likely than those younger, and those that already had one or two previous child were less likely than those without in the never married category. This might suggest differential preference and need as well as awareness about implication of unprotected sexual activity among the two population of women³⁰. Elsewhere, young adults are often reported to engage in safer sexual activity than the adolescents³¹. Within the ever married group in this study, religion and place of residence were associated with the probability of the modern contraceptive uptake. Women of Catholic faith were more likely than those that professed Islamic religion. This observation did not align with the widely known perception of Catholic worshipers and modern contraception^{31,32}. This will require further studies especially social science research that might provide better insight on the motivation to use modern contraception among Catholic contrary to their doctrine.

It is fascinating that the proportions of those uptaking modern contraception among “never” and “ever” married groups is the same at 17 years post-sexual initiation. This is despite each group having different proportional trend from the point of sexual initiation. It might suggest that women at this particular age range have similar reproductive and sexual intentions. Seventeenth year within the reproductive year is most likely above an average age for childbearing and also probably close to the peri-menopausal age within Nigerian setting^{33,34}. This has technically removed the observed age difference of the respondents.

It is pertinent to note that our findings have some limitations. The DHS data cannot replace census in its entirety and as such, there might still be some variations in the observed response. The question on age of sexual initiation is prone to recall bias and sometimes, the veracity of information provided could be challenged. There is a concern that sexual initiation question could be emotive and this might not elicit correct response. This is one of the reasons why some developed countries have separated sexual health survey from other reproductive health survey^{35,36}. In addition, they also adopted alternative techniques such as audio computer assisted self-interview or other self-administered methods to maintain privacy and confidence to sexual activity questions³⁵. It will also have been important to analyse the role of respondents’ sexual partners in the uptake.

Despite all these limitations, this study have significant message to show for family planning policy and programming in Nigeria. First, the analysis vividly showed that a large proportion of women in Nigeria are not using effective contraceptive method during their early sexual life. This is the period where sexual adventure and liberality is common with attendant health, social and psychological problems^{37,38}. Second, the regional variations and other relevant factors will assist policy makers to identify gaps on current family planning programmes and also guide the development partners to identify critical population within the sexually active group for their interventions.

Conclusions

This study shows that modern contraceptive uptake among sexually active population of women in Nigeria is very low and there is a huge window of period where they engage in unprotected sexual activity with possible health risks. This gap needs urgent and proactive policy and intervention to address this worrisome observation. An acceptable uptake of modern contraceptives requires massive, multi-sectoral and well-coordinated efforts. This is needed to promote and educate sexually active women with their partners on proper use of desired effective method.

Acknowledgements

We acknowledge the National Population Commission (Nigeria) and ICF International for granting us access to this data.

Competing Interest

The authors declare no competing interest

Authors Contributions

AFF conceived and designed the study, analyzed and wrote the results, partook in writing the introduction and methodology. ASA partook in study design, data analysis, writing the introduction and methodology. OMB partook in study design, data analysis, writing the introduction and discussion. All authors proofread the final version of the manuscript.

Funding

The authors received no funding for this study

Data Sharing

The authors agree to share the data used for this study

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STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	Page
Title and abstract	1	(a) Indicate the study’s design with a commonly used term in the title or the abstract	2
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4-5
Objectives	3	State specific objectives, including any prespecified hypotheses	5
Methods			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6-7
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	6-7
Bias	9	Describe any efforts to address potential sources of bias	6-7
Study size	10	Explain how the study size was arrived at	6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6-7
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	7
		(b) Describe any methods used to examine subgroups and interactions	7
		(c) Explain how missing data were addressed	7
		(d) If applicable, describe analytical methods taking account of sampling strategy	7
		(e) Describe any sensitivity analyses	7
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8
		(b) Give reasons for non-participation at each stage	na
		(c) Consider use of a flow diagram	na
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8
		(b) Indicate number of participants with missing data for each variable of interest	Na
Outcome data	15*	Report numbers of outcome events or summary measures	8
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	10-13
		(b) Report category boundaries when continuous variables were categorized	13

		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	Na
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	10-13
Discussion			
Key results	18	Summarise key results with reference to study objectives	14
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	3,14
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	13-14
Generalisability	21	Discuss the generalisability (external validity) of the study results	15-16
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	16

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

Survival analysis of time to uptake of modern contraceptives among sexually active women of reproductive age in Nigeria

Journal:	BMJ Open
Manuscript ID	bmjopen-2015-008371.R1
Article Type:	Research
Date Submitted by the Author:	19-Aug-2015
Complete List of Authors:	Fagbamigbe, Adeniyi; University of Ibadan, Epidemiology & Medical Statistics Adebawale, Ayo; University of Ibadan,, Epidemiology & Medical Statistics MORHASON-BELLO, Imran; University of Ibadan,, Department of Obstetrics & Gynaecology,
Primary Subject Heading:	Public health
Secondary Subject Heading:	Epidemiology, Reproductive medicine, Public health, Sexual health, Research methods
Keywords:	EPIDEMIOLOGY, REPRODUCTIVE MEDICINE, SOCIAL MEDICINE, PUBLIC HEALTH, STATISTICS & RESEARCH METHODS

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Survival analysis of time to uptake of modern contraceptives among sexually active women of reproductive age in Nigeria

***Fagbamigbe, Adeniyi Francis^{1,2}, Adebowale, Ayo Stephen¹, Morhason-Bello, Imran Oludare³**

¹Department of Epidemiology and Medical Statistics, Faculty of Public Health, College of Medicine, University of Ibadan. Nigeria

²School of Research and Postgraduate Studies (SoRPS), Faculty of Human and Social Sciences (HSS), North West University, Mafikeng, South Africa

³Department of Obstetrics and Gynaecology, Faculty of Clinical Sciences, College of Medicine, University of Ibadan/University College Hospital. Nigeria

*** For Correspondence:** *E-mail:* fadeniyi@cartafrica.org; franstel74@yahoo.com *Phone:* +2348061348165 +833500685

For peer review only

Survival analysis of time to uptake of modern contraceptives among sexually active women of reproductive age in Nigeria

Abstract

Context: Literature is replete on the prevalence and factors influencing contraceptive use in Nigeria but there is knowledge gap in time to uptake of Modern Contraceptives (MC) among sexually active women at the national level in Nigeria.

Objective: To assess the timing of MC uptake among married and never married women in Nigeria.

Design: A retrospective cross sectional study

Data and method: We utilized a nationally representative 2013 Demographic and Health Survey data in Nigeria, and MC uptake time was measured as period between first sexual intercourse and first use of MC. Nonusers of MC were censored as of the date of the survey. Kaplan Meier survival curves were used to determine the rate of uptake. Cox-proportional Hazard model was used to determine variables influencing the uptake at 5% significance level.

Participants: A total of 33223 sexually active women of reproductive age

Outcome measure: Time of uptake of MC after first sexual intercourse

Results: The median MC uptake time was 4 years in never married and 14 years among ever married women. Significant differences in MC uptake existed in respondents' age, location, education and wealth status. Never married women were about three times more likely to uptake MC than ever married women (aHR=3.24(95%CI:2.82-3.65)). Women with higher education were six times more likely to uptake MC than those without education (aHR=6.18(95%CI:5.15-7.42)).

Conclusion: The rate of MC uptake is low, and timing of contraceptive uptake during or after first sexual intercourse differed across marital status. While age and number of children ever born influenced MC uptake among the never married women, religion and place of residence were associated with the probability of the modern contraceptive uptake among ever married women.

Key words: Marital status, Modern contraceptives uptake, Survival analysis, Women, Nigeria

Strength and Limitation

The strengths of the paper are

- We used a large nationally representative sample to assess duration between time of first sexual activity and time of MC as against the usual factors
- We focused on the global target population with high unmet need for family planning
- We used survival analysis method to determine the time wasted before uptake of MC
- Same analysis could also be performed in other Sub-Saharan African countries since Demographic and Health Survey data has international similarity. This would provide opportunity to compare policies and response to MC uptake in the region.

The limitations are

- We relied on recall of participants to determine time of first sexual activity and MC uptake
- It is difficult to give a temporal evidence of explanatory factors considered in the Cox-regression model since the data is cross-sectional.
- We did not use partners' data in the analysis.

Survival analysis of time to uptake of modern contraceptives among sexually active women of reproductive age in Nigeria

Background

Contraception is regarded as one of the cheapest and effective strategy to promote sound reproductive health¹⁻³. This is why governments and international agencies are making frantic efforts to ensure that individuals within childbearing age have unhindered access to modern contraceptive commodity. The predominantly high fertility rates in developing countries⁴ especially in sub-Saharan Africa is not disconnected from low contraceptive use^{2,5}. The effect of high fertility on women and family is enormous. Apart from maternal depletion syndrome and its attendant problems, contraceptive also prevents unwanted pregnancies, thereby lowering unsafe abortion and maternal mortality. The economic pressure of managing large family size coupled with overwhelming associated health complications of such is a pointer for embracing modern contraception in Nigeria⁶.

The current maternal mortality ratio (MMR) in Nigeria is 576 per 100,000 live births⁷. One in three women give birth before age 20, and also, pregnancy related morbidity and mortality rates are also high among this group. One quarter of the estimated 20 million unsafe abortions and 70,000 abortion related deaths each year occur among women aged 15-19 years. Similarly the risk of dying during childbirth in this age group doubled those aged 20 years and above⁸. An estimated fourteen million unwanted pregnancies occur yearly, with almost half in women aged 15-24 years in sub-Saharan Africa⁹. In addition, 16% of the currently married women in Nigeria have unmet need for family planning⁷. This is slightly lower than 20% reported in 2008¹⁰. Modern Contraception (MC) is one of the primary prevention of maternal deaths and it could also prevent 90 percent of abortion related morbidity and mortality¹.

Nigeria, the most populous black nation has witnessed sporadic increase in population growth in the last two decades¹¹. In 1990, the population was slightly above 80 million and this has increased to 170 million in 2013¹². Consequently, the high increase in population growth combined with low contraceptive use in Nigeria prompted the Federal Government to institute policies at different times aimed at reducing the population growth rate. For instance, the National Policy on Population for Development was launched in 1988¹³ and was revised in 2004¹⁴. However, a review of the policies identified low use of modern contraceptive as barrier towards its effectiveness¹⁵. The reviewed policy was intended to overcome the shortcomings of the earlier policy and ensure increase in contraceptive use nationwide.

MC uptake in the developing countries is generally lower than developed countries¹⁶. Worldwide, the Contraceptive use Prevalent Rate (CPR) is 56 percent. The CPR in developed countries is 62% while it is 54% in less developed nations and 28% in least developed nations. In Africa, the CPR is 26% and 20% in sub-Sahara Africa. Nigeria and her neighbouring

countries have about 10 percent MC uptake value ⁴. Nigeria has a total fertility rate of 5.6, the growth rate is 2.5% per annum and the CPR is less than 10.0% ^{7,11}.

Previous studies have identified socio-demographic differentials in contraceptive use. Among factors identified in these studies are age at first sexual intercourse, religion, education, place of residence, and economic status ^{2,5,7,17}. The reproductive choices of young adults has also been found to have a great impact on their schooling, health and ultimately, transition to adulthood ^{18,19}. In particular, early child bearing has been attributed to higher rates of maternal and child mortality, truncated education, larger family sizes, which in turn, lead to increase in population ²⁰.

Knowledge of family planning methods is 85% but the uptake is less than 15% ^{7,21}. The most common MC among women are the pill (71%), injectables (68%), and the male condom (67%) whereas male condom (91%), the pill (65%), and injectables (60%) are the most common methods among men. While 15% of currently married women use any method of contraception, only 10% use a modern method of family planning ⁷. The reasons why high knowledge of family planning methods has failed to translate to high uptake remain a great concern to government and researchers in Nigeria.

In Nigeria, the national surveys have revealed that median timing of first sexual intercourse is below 18 years ^{7,21}. This is the age when adolescents are most susceptible to sexually transmitted infections including HIV/AIDS and human papillomavirus, and other health complications. Unfortunately, in Nigeria context, cultural beliefs do not support discussion on reproductive issues including the use of MC among young individuals². People see young women who demand for contraceptive as promiscuous and as a result either choose not to use or rely on their male sexual partners who are likely to be older or their peers ²¹. Where such provisions are not available, young women have sex without the use of any contraception or make use of traditional method which is often not effective ³. Thus teenage pregnancy, early marriage or single parenthood may be the end result. Due to shame attached to premarital pregnancy in Nigeria, unmarried women are expected to protect themselves from such embarrassment³. Equally, the married are expected to use modern contraceptive to guard against unwanted pregnancies in marriage^{22,23}. In this regard, we argue that the timing of uptake of modern contraceptive might be different among women in marital union and those never married. This differential in timing of contraceptive uptake by marital status is yet to be adequately documented in Nigeria.

Literature is replete on the prevalence and factors influencing contraceptive use ^{3,22-25} but there is little or no robust analysis on time to uptake of modern contraceptives among sexually active women at the national level in Nigeria. This study was designed to model the time it takes sexually active women in Nigeria to begin the use of modern contraceptives after the first sexual experience, and also, to identify factors influencing the uptake. The objectives were conceived

with the view to providing information that will be useful for effective family planning programming in Nigeria.

Methods:

We used the data collected during the 2013 Nigeria Demographic and Health Survey (NDHS). The sample was nationally representative that covered the entire population residing in non-institutional dwelling units in the country. The survey used the list of enumeration areas (EAs) prepared for the 2006 Population Census in Nigeria as a sampling frame. This was provided by the National Population Commission. The sample was designed to provide population and health indicator estimates at the national, zonal, and state levels. The sample design allowed for specific indicators to be calculated for each of the six zones, 36 states, and the Federal Capital Territory, Abuja.

Administratively, Nigeria is divided into 36 states and Federal Capital territory (Abuja). Each state is subdivided into local government areas (LGAs), and each LGA is divided into localities. There are 774 LGAs in the country. In addition to these administrative units, during the 2006 population census, each locality was subdivided into census enumeration areas. The primary sampling unit (PSU), referred to as a cluster in the 2013 NDHS, is defined on the basis of EAs from the 2006 EA census frame. The 2013 NDHS sample was selected using a stratified three-stage cluster design consisting of 904 clusters, 372 in urban areas and 532 in rural areas. A representative sample of 40,680 households was selected for the survey, with a minimum target of 943 completed interviews per state. A fixed sample take of 45 households were selected per cluster. All women age 15-49 who were either permanent residents of the households in the 2013 NDHS sample or visitors present in the households on the night before the survey were eligible and were interviewed. A total of 39,902 women age 15-49 were identified as eligible for individual interviews, and 98 percent of them were successfully interviewed. Of the 38,948 respondents interviewed, 33,223 (85.3%) had had sex. Further analysis of MC uptake were therefore based on the information provided by this respondents.

Among others, the women were asked questions on their background characteristics (age, religion, education, literacy, media exposure, etc.), reproductive history and childhood mortality, knowledge, source, and use of family planning methods. Time to uptake of MC since first sexual intercourse (sexual initiation) was used as dependent variable. Age, region, education, religion, residence, husbands' education, children everborn, wealth status and marital status are among socio-demographic factors identified in previous studies as determinants MC use^{2,3,5,17,22-25}. The theoretical rationale for including these factors include differentials in MC availability in location (rural/urban) and geographical zones, affordability (wealth), knowledge (education), confidence to buy (age) etc. Details have also been documented^{3,5,17,24,25}. The time to uptake of MC was computed as the time (years) difference of current age (v012) and age at first sexual intercourse (v531) for nonusers and censored accordingly. For respondents using MC, the time to

uptake of MC was computed as time difference between year of uptake of MC and age at sexual initiation. Women who never had sexual intercourse were excluded from the study.

Time to MC uptake was modeled using a discrete-time duration model. The survival time is assumed to begin at the time a woman had her first sexual intercourse until the time she started using modern contraceptives. The survival time is censored for sexually active women who has never used MC as of the time of the survey. The duration from first sexual intercourse to MC uptake, “*T*”, is assumed to be a discrete random variable that takes on only positive integer. The populations at risk are all sexually active women involved in the study. The observation continues until time “*t*”, at which the event of interest, uptake of MC, occurs or the time to the end of the study when observation is censored in 2013, the year of the survey, if the individual has not uptake MC. The study ends for an individual at time “*T = t*” if she had started using MC. Two quantitative terms were used in this study. These are; the survivor function *S(t)* and hazard function *h(t)*. The survivor function gives the probability that a person survives longer than some specified time *t* without uptaking MC, while the hazard function gives the instantaneous potential per unit time for MC to be uptaken, given that the individual MC uptaking time survived up to time *t*. Survival and hazard function are mathematically denoted by

$$S(t(j-1)) = \prod_{i=1}^{j-1} P(T > t_{(i)} | T \geq t_{(i)}) \dots\dots\dots (1)$$

and

$$h(t) = \frac{P(t \leq T < t + \Delta t | T \geq t)}{\Delta t} \dots\dots\dots (2)$$

respectively.

The Cox-proportional Hazard model was used to predict the strength of the relationship between each the selected independent variables and censored timing of MC uptake.

The Cox model is usually in terms of hazard model which gives an expression for the hazard at time *t* for an individual with a given specification of a set of independent denoted by “*X*” which are predictor variables that is being modeled to predict individuals’ hazard. The Cox proportional hazards regression assumes the relationship for one covariate where *h₀(t)* is the baseline hazard function, *x_i* are the covariates and *β_i* are the coefficients.

$$h(t; x) = h_0(t) \exp(x\beta) \dots\dots\dots (3)$$

We also stratified Cox regression estimates. In the stratified estimator, the hazard at time *t* for a subject in group *i* is assumed to be

$$h_i(t) = h_{i0}(t) \exp(\beta_1 x_{i1} + \dots + \beta_k x_{ik}) \dots\dots\dots (4)$$

,

That is, the coefficients are assumed to be the same, regardless of group, but the baseline hazard can be group specific. In our stratified Cox analysis, we tested whether the proportional-hazards assumption was violated using the significance of the hazard ratios and the Wald chi square statistics. Variables significant in the bivariate cox regression were used in the multiple cox regression to assess association with outcome variable while controlling for confounders. Sampling weights were applied in our analysis. The weighting was based on the sampling fractions derived from the sample size and the total population of each state constituting Nigeria. Statistical significance was determined at $p\text{-value} = 0.05$. We used the Stata (version 13) statistical analysis software for the analysis.

Ethical Approval:

Ethical approval was sought from Nigeria National Health Research Ethics Committee by the data originators and granted before the commencement of the survey. Also, informed consents were received from the participants before responding to questions used during the survey. We obtained the approval from measure DHS for permission to use the data prior to analysis.

Results

Of the 38,948 respondents, 85.3% had had sex. Mean age of sexual debut was 14.31 (95% CI = 14.24-14.38) with a range of 8-46 years. About three fifths (57.9%) of the respondents were from rural areas, 37.8% had no education, 20.1%, 17.4% and 18.3% aged 15-19, 20-24 and 25-29 years respectively. Only 42.6% of respondents aged 15-19 years had had sex. Only 11.4% of the sexually active respondents were currently using MC. Highest use of MC was found among respondents aged 20-24 years, 27.2% in the South West, 16.8% in urban areas 26.5% among respondents with higher educational attainment 18.7% among women in richest wealth quintiles, 15.8% among never married and 9.9 % among ever married women. The median year to uptake of MC was 4 years, 14 years and 13 years among the never married women, ever married women and all sexually active women respectively.

Table 1: Distribution of respondents by socio-demographic characteristics, sexual activities, MC use and median year to uptake of MC

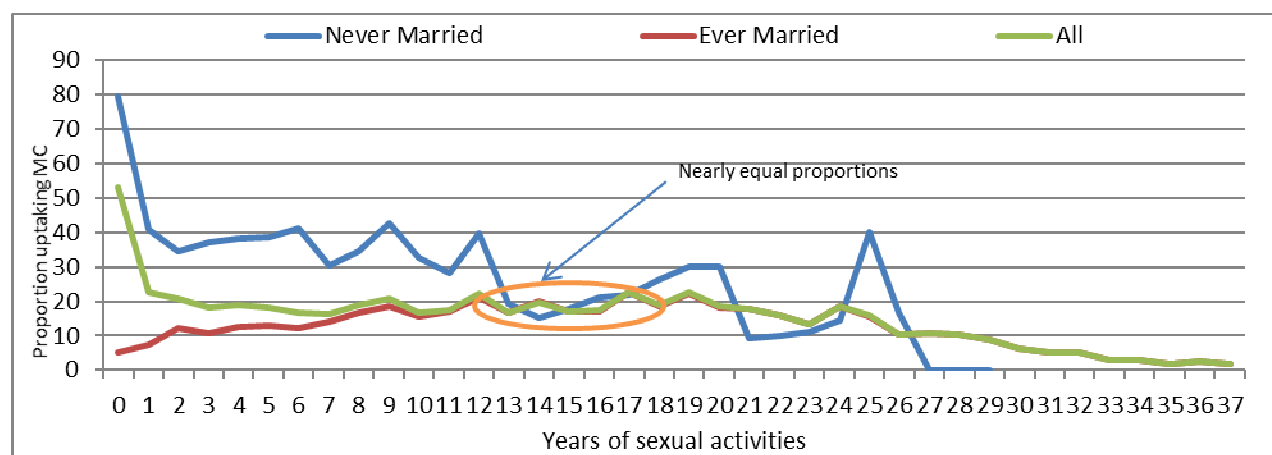
Variable	Category	N=38948 (%)	% who had ever had sex	% using MC among SAW^	Median time of up taking MC		
					Never Married Women	Ever Married Women	Both
Age Group	15-19	20.1	42.6	12.7	2	3	2
	20-24	17.4	86.6	16.0	3	6	5
	25-29	18.3	97.0	13.2	6	10	10
	30-39	14.0	99.2	13.6	12	17	16
	40-49	12.1	99.8	11.2	22	27	27
Region	North Central	14.3	81.7	16.5	3	12	11
	North East	14.8	88.4	3.8	3	14	13
	North West	30.5	90.3	3.3	3	14	14
	South East	11.5	78.7	17.9	3	15	13
	South South	12.7	84.4	21.9	4	15	12

	South West	16.2	83.1	27.2	3	14	12
Residence	Urban	42.1	80.3	20.9	4	14	12
	Rural	57.9	85.3	8.8	3	14	13
Wealth Index	Poorest	18.7	91.3	3.2	3	14	14
	Middle	19.2	83.7	12.6	3	14	13
	Richest	21.6	81.0	23.3	4	13	12
Highest Education Level	No education	37.8	95.9	2.0	4	15	15
	Primary	17.3	91.5	13.2	4	16	15
	Secondary	35.8	71.3	22.7	3	11	9
	Higher	9.1	88.0	30.1	5	12	10
Husband's Highest Educ Level	No education	38.8	100.0	2.1	na	15	15
	Primary	18.4	100.0	10.9	na	15	15
	Secondary	28.1	100.0	14.7	na	12	12
	Higher	13.7	100.0	18.9	na	13	13
Religion	Catholic	11.1	80.1	20.9	4	14	12
	Other Xtian	35.7	82.6	21.8	4	14	12
	Islam	51.7	88.5	5.3	2	13	13
	Traditionalist	0.9	90.3	4.7	3	18	18
Marital status	Never Married	23.9	41.6	38.0	4	na	4
	Ever Married	76.1	100.0	9.9	na	14	14
Children Ever born	No Birth	29.1	50.0	24.4	3	3	3
	1-2 Births	21.9	100.0	10.1	5	6	6
	3-4 Births	19.7	100.0	13.0	13	12	12
	>4 Births	29.3	100.0	10.4	19	21	21
Total	Total	100.0	85.3	13.3	4	14	13

^n=33223

At the year of sexual initiation 79.4% of never married women and 5.2% of ever married women used MC; 40.6% versus 7.3% during the second year; and 34.4% versus 12.0% during third year etc. The proportion fell among never married women as the year from sexual initiation increased but it rose gently among ever married women to its peak at about 17th year of sexual activities where it remain the same without overall proportion of MC users among all women. Proportions using MC within each group were about the same between the 12th and 17th year of sexual activities (Figure 1).

Figure 1: Proportions of sexually active women up-taking MC by years of sexual activities and marital status



Over two fifths (41.5%) of the MC users were currently using male condoms, 22.3% used Injections, 17.2% were on pills, 6.9% on IUD while less than one percent each used Female condoms, diaphragm, foam, and male sterilization (data not shown). In Figure 2, we compared the rate of MC uptake among sexually active women by marital status. The rate of MC uptake among the never married women was higher than among ever married women.

Figure 2: Survival analysis of MC uptake among all respondents by Marital Status

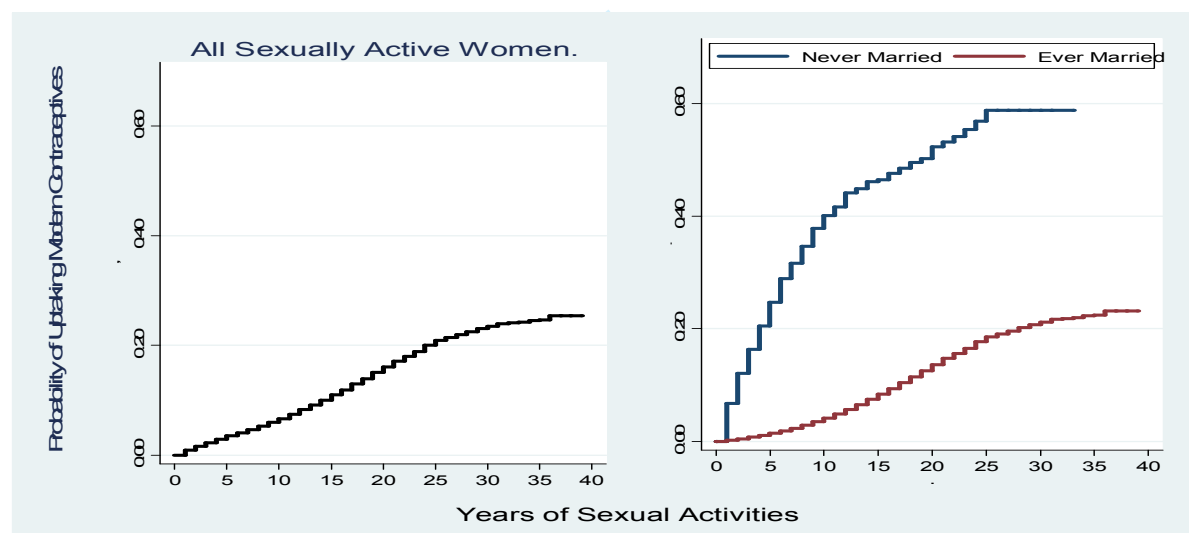
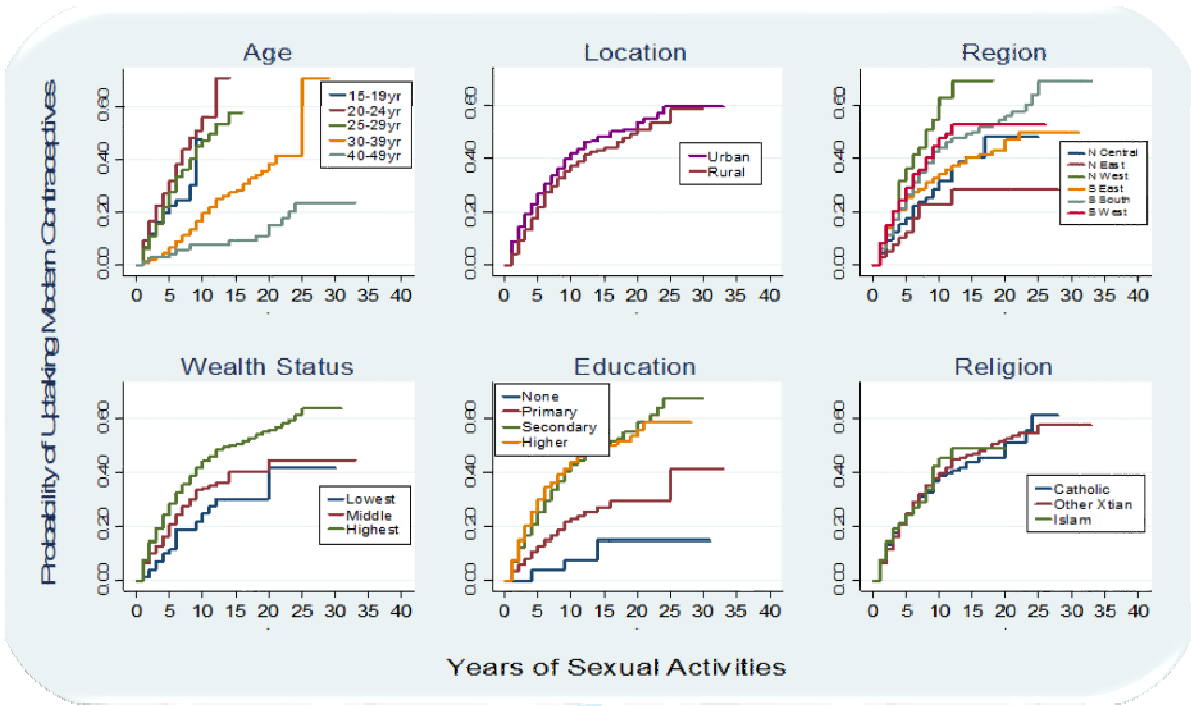


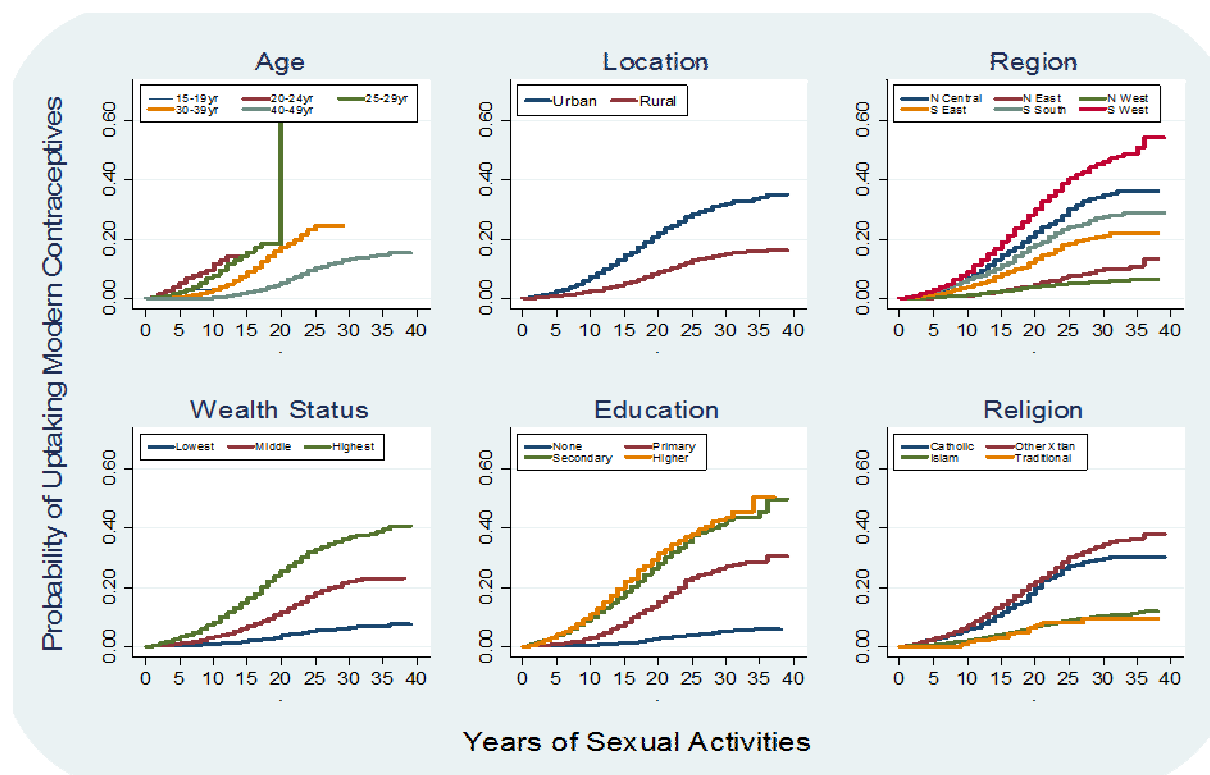
Figure 3 shows the probabilities of MC uptake among the never married women according to their socio-demographic characteristics. Considering age, never married women aged 20-24 years had higher chances than other never married women to uptake MC as they progressed in the years of sexual activities. Similarly, never married women in urban areas and within the highest wealth quintiles had highest probabilities of uptaking MC.

Figure 3: Probabilities of MC uptake among Never married women according to some selected socio-demographic characteristics



In Figure 4, the probabilities of MC uptake among the ever married women according to their socio-demographic characteristics were shown. Ever married women in the South West region had highest likelihood of up taking MC than ever married women from other regions as they progressed in their years of sexual activities. Also, ever married women who were either Catholics or practicing other Christian faith had higher probability of MC uptake than other ever married women as years of sexual activities progresses.

Figure 4: Probabilities of MC uptake among Ever married women according to some selected socio-demographic characteristics



The unadjusted hazard ratio showed that chances of a never married woman to uptake MC reduced by 7% for every additional year after sexual initiation. Those aged 20-24 years are 42% more likely to uptake MC than never married women aged 15-19 years (HR=1.42(95% CI: 1.14-1.77)). Never married women from North East zone were 31% times less likely to uptake MC than their counterparts from North Central (HR=0.69 (95% CI: 0.45-1.04)). On wealth status, never married women in richest wealth quintile are more over twice likely to uptake MC than never married women in poorest wealth quintile while those in having secondary (HR=7.14 (95% CI: 2.67-19.11) or higher (HR=7.88(95% CI: 2.93-21.16) education were over seven times more likely to uptake MC than those without any formal education (Table 2). Among the ever married women, those from south west were about 40% more likely to uptake MC than those from the North Central (HR=1.42(95% CI:1.25-1.58)) and over 80% times less likely in the North East (HR=0.20 (95% CI:0.17-0.24)).

In the multivariate analysis, the adjusted Hazard Ratio (aHR) shows that never married woman aged 20-24 years to uptake was 31% higher than a never married woman aged 15-19 years (aHR=1.31(95% CI:1.05-1.63)) while never married woman with 1 or 2 births were 22% times

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less likely to uptake MC than those with no previous birth (aHR=0.78(95% CI: 0.65-0.93)). Ever married women who practiced Islam were 42% times less likely to uptake MC compared with their counterparts in Catholic religion (aHR=0.58 (95% CI:0.49-0.67)). After controlling for other variables a sexually active woman with higher education in Nigeria were six times more likely to uptake MC than those without any formal education(aHR=6.18(95% CI:5.15-7.42)) just as rural women were 17% less likely to uptake MC than the urban sexually active women (aHR=0.83(95% CI: 0.76-0.90) as shown in Table 3.

Table 2: Unadjusted Determinants of MC uptake among Never married and ever

		Unadjusted of determinants of MC uptake		
Characteristics	Categories	Never Married HR(95% CI)	Ever Married HR(95% CI)	Both HR(95% CI)
Marital Status	Never Married			10.1(9.2-11.0)*
	Ever Married			Reference
Age(years)+		0.93(0.92-0.94)*	0.89(0.88-0.90)*	0.88(0.87-0.88)*
Age Group	15-19	Reference		
	20-24	1.42(1.14-1.77)*	1.40(0.94-2.10)	0.99(0.82-1.20)
	25-29	1.08(0.86-1.37)	0.68(0.45-1.01)	0.46(0.38-0.55)*
	30-39	0.37(0.27-0.50)*	0.29(0.19-0.43)*	0.16(0.13-0.19)*
	40-49	0.12(0.06-0.25)*	0.10(0.06-0.14)*	0.05(0.04-0.06)*
Region	North Central	Reference		
	North East	0.69(0.45-1.04)	0.20(0.17-0.24)*	0.22(0.18-0.25)*
	North West	2.04(1.38-3.03)*	0.15(0.13-0.18)*	0.16(0.14-0.19)*
	South East	1.22(0.94-1.57)	0.56(0.49-0.65)*	0.80(0.70-0.90)*
	South South	1.43(1.14-1.80)*	0.80(0.71-0.90)*	1.11(1.00-1.23)*
	South West	1.61(1.25-2.07)*	1.42(1.28-1.58)*	1.47(1.34-1.62)
Residence	Urban	Reference		
	Rural	0.80(0.69-0.92)*	0.38(0.35-0.41)*	0.39(0.37-0.42)*
Wealth Index	Poorest	Reference		
Index	Middle	1.7(1.23-2.35)*	3.69(3.19-4.28)*	4.00(3.50-4.57)*
	Richest	2.4(1.79-3.21)*	8.09(7.14-9.17)*	8.52(7.60-9.56)*
Highest	No education	Reference		
Education	Primary	3.36(1.21-9.33)*	6.39(5.51-7.40)*	6.59(5.70-7.62)*
	Secondary	7.14(2.67-19.1)*	13.1(11.4-15.1)*	15.8(13.8-18.1)*
	Higher	7.88(2.93-21.2)*	14.4(12.3-16.8)*	18.9(16.3-21.9)*
Religion	Catholic	Reference		
	Other Xtian	1.01(0.85-1.21)	1.18(1.05-1.33)*	1.11(1.00-1.22)*
	Islam	1.09(0.81-1.46)	0.31(0.28-0.36)*	0.25(0.22-0.28)*
	Traditionalist	0.96(0.13-6.85)	0.28(0.16-0.48)*	0.23(0.14-0.38)*
Children	No Birth	Reference		
Ever born	1- 2 Births	0.73(0.61-0.86)*	5.48(3.80-7.91)*	0.47(0.42-0.52)*
	3- 4 Births	0.31(0.15-0.66)*	3.72(2.58-5.35)*	0.30(0.27-0.34)*
	>4 Births	0.15(0.02-1.08)	1.43(0.99-2.06)	0.13(0.11-0.14)*

* Significant at 5% p-value +treated as continuous variable HR Hazard Ratio CI Confidence Interval MC Modern Contraceptives

Table 3

Variable	Categories	Adjusted of determinants of MC uptake		
		Never Married HR(95% CI)	Ever Married HR(95% CI)	Both HR(95% CI)
Marital Status	Never Married			3.21(2.82-3.64)*
	Ever Married			Reference
Age(years)+		0.91(0.89-0.92)*	0.84(0.83-0.85)*	0.84(0.83-0.85)*
Age Group	15-19			
	20-24	1.31(1.05-1.63)*	0.75(0.50-1.12)	0.94(0.78-1.14)
	25-29	0.89(0.70-1.14)	0.26(0.17-0.38)*	0.38(0.31-0.46)*
	30-39	0.28(0.20-0.39)*	0.08(0.05-0.12)*	0.11(0.09-0.13)*
	40-49	0.10(0.05-0.20)*	0.02(0.01-0.03)*	0.03(0.02-0.04)*
Region	North Central			
	North East	0.86(0.56-1.31)	0.41(0.34-0.49)*	0.46(0.39-0.54)*
	North West	2.49(1.67-3.71)*	0.4(0.33-0.47)*	0.47(0.40-0.55)*
	South East	1.47(1.12-1.92)*	0.39(0.34-0.46)*	0.55(0.48-0.62)*
	South South	1.58(1.24-2.02)*	0.49(0.43-0.56)*	0.68(0.61-0.75)*
Residence	South West	1.41(1.08-1.83)*	0.94(0.84-1.05)	1.06(0.95-1.17)
	Urban			
Wealth Index	Rural	0.97(0.83-1.14)	0.8(0.73-0.88)*	0.83(0.76-0.90)*
	Poorest			
	Middle	1.41(1.01-1.97)*	1.72(1.47-2.02)*	1.71(1.49-1.98)*
Index	Richest	1.84(1.33-2.54)*	2.32(1.98-2.71)*	2.19(1.90-2.53)*
	No education			
Highest Education	Primary	2.88(1.03-8.03)*	3.17(2.69-3.74)*	3.29(2.80-3.87)*
	Secondary	4.47(1.66-12.1)*	4.46(3.76-5.29)*	4.90(4.16-5.78)*
	Higher	5.46(2.00-14.9)*	5.57(4.59-6.76)*	6.18(5.15-7.42)*
Religion	Catholic			
	Other Xtian	0.95(0.79-1.15)	0.93(0.82-1.05)	0.94(0.85-1.05)
	Islam	1.14(0.83-1.56)	0.58(0.49-0.67)*	0.60(0.52-0.69)*
	Traditionalist	0.74(0.10-5.36)	0.67(0.39-1.15)	0.67(0.40-1.12)
Children	No Birth			
	1- 2 Births	0.78(0.65-0.93)*	3.46(2.40-4.99)*	0.58(0.52-0.65)*
	3- 4 Births	0.49(0.23-1.04)	3.58(2.48-5.17)*	0.60(0.53-0.68)*
	>4 Births	0.48(0.07-3.56)	3.40(2.35-4.93)*	0.60(0.52-0.68)*

* Significant at 5% p-value +treated as continuous variable aHR adjusted Hazard Ratio CI Confidence Interval MC Modern Contraceptives

Discussion

Modern contraceptive is an effective method to prevent unplanned pregnancy and some other associated health complications of unprotected sexual activity such as HIV, HPV infection and STIs ²⁶. Uptake of modern contraceptive method is often measured and compared across different settings, and it is sometimes used as proxy indicator for burden of unprotected sexual activity and unplanned pregnancy ²⁷. In this study, the average national modern contraceptive

uptake among sexually active women was 11.4 percent. The uptake is highest among those aged 20 to 24 years, resident in southwest, living in urban community, and with highest education and wealth quintiles. The shortest interval to uptake modern contraception was four years after initiation of sexual activity, and this was understandably among never married women. This interval is more than 3 times shorter than the ever married women. The proportionate trend of those that used modern contraception by unit change of year from point of sexual initiation nosedive in the never married women, and thereafter, plateau after 17 years. On the contrary, there was a steady rise among the ever married till 17 years after sexual initiation. Both groups however had similar proportion of contraceptive uptake at 17 years after sexual initiation.

The general low level of modern contraceptive uptake in Nigeria remained a source of concern especially among the sexually active women. Though the average uptake now is marginally higher than 2008 DHS¹⁰ but this is not commensurate with the investment on family planning in the country within the period¹⁰. Unlike the previous published articles on modern contraception in Nigeria, this analysis modelled time interval between sexual initiation and uptake of contraception using a nationally representative data.

The lessons derivable are in manifold. First, there is a lag period of at least four years averagely before access to modern contraception among sexually active women in Nigeria. This could possibly be due to either lack of awareness or access to contraceptive commodities and its services. Second, age long factors such as regional variations, urban-rural divide, wealth indices, and education that had been associated with uptake of modern contraception; are still significant in this analysis^{22,23,25}. The low contraceptive uptake in Northern Nigeria is responsible for a comparative upsurge in several family planning interventions in this region than others²⁴. Despite this effort, Southern regions still have a higher modern contraception uptake among the sexually active women. The known associated factors responsible for the poor uptake in Northern Nigeria are education, socio-cultural disposition and interpretation of modern contraception^{28,29}. Some have argued that Northern regions of the country still have a conservative disposition towards modern contraceptive methods of family planning²⁸. This was buttressed with an evidence of a fairly higher awareness of family planning and use of traditional or unorthodox methods and high fertility rates among women in the north²⁴.

Another interesting finding is that some factors that are associated with the probability of modern contraceptive uptake differed by marital status. Women aged 20 – 24 were 31 percent more likely than those younger, and those that already had one or two previous child were less likely than those without in the never married category. This might suggest differential preference and need as well as awareness about implication of unprotected sexual activity among the two population of women³⁰. Elsewhere, young adults are often reported to engage in safer sexual activity than the adolescents³¹. Within the ever married group in this study, religion and place of

residence were associated with the probability of the modern contraceptive uptake. Women of Catholic faith were more likely than those that professed Islamic religion. This observation did not align with the widely known perception of Catholic worshipers and modern contraception^{31,32}. This will require further studies especially social science research that might provide better insight on the motivation to use modern contraception among Catholic contrary to their doctrine.

It is fascinating that the proportions of those uptaking modern contraception among “never” and “ever” married groups is the same at 17 years post-sexual initiation. This is despite each group having different proportional trend from the point of sexual initiation. It might suggest that women at this particular time have similar reproductive and sexual intentions. Seventeenth year within the reproductive year is most likely above an average age for childbearing and also probably close to the peri-menopausal age within Nigerian setting^{33,34}. This has technically removed the observed age difference of the respondents.

The observed ‘lag period’ in this analysis might be a pointer that access to modern contraceptive in the early reproductive life of women is poor. Incidentally, this period is also the age range of adolescent and young adults. Although, Nigerian Government have implemented several programmes including family life education or sexuality education to educate and promote safer sexual practices among adolescents and young adults, but the family planning component did not receive much attention³⁵. The programme suffered neglect largely due to concern of government on fears expressed by parents/guardian and religious leaders that early introduction of family planning interventions to youth might encourage sexual activity³⁵. Whereas, in some developed countries, young people have unhindered access to modern contraception messages and services, and this has helped to avert the consequences of unplanned pregnancy and sexually transmitted infections³⁶. Apart from this factor, there are no specialized centers owned by government in Nigeria where young people could access modern contraception freely³⁷. Rather, only very few non-governmental organizations have youth centers in some states to offer this service. It is therefore important for policy makers to design cultural sensitive interventions that will promote access to effective modern contraception which could potentially reduce the unmet need of family in this critical ‘lag period’. There should be renew energy to proactively invest on this unmet need to address the associated challenges of unprotected sexual activity.

It is pertinent to note that our findings have some limitations. The DHS data cannot replace census in its entirety and as such, there might still be some variations in the observed response. The question on age of sexual initiation is prone to recall bias and sometimes, the veracity of information provided could be challenged. There is a concern that sexual initiation question could be emotive and this might not elicit correct response. This is one of the reasons why some developed countries have separated sexual health survey from other reproductive health survey^{38,39}. In addition, they also adopted alternative techniques such as audio computer assisted self-interview or other self-administered methods to maintain privacy and confidence to sexual

activity questions³⁸. It will also have been important to analyse the role of respondents' sexual partners in the uptake.

Despite all these limitations, this study have significant message to show for family planning policy and programming in Nigeria. First, the analysis vividly showed that a large proportion of women in Nigeria are not using effective contraceptive method during their early sexual life. This is the period where sexual adventure and liberality is common with attendant health, social and psychological problems^{40,41}. Second, the regional variations and other relevant factors will assist policy makers to identify gaps on current family planning programmes and also guide the development partners to identify critical population within the sexually active group for their interventions.

Conclusions

This study shows that modern contraceptive uptake among sexually active population of women in Nigeria is very low and there is a huge window of period where they engage in unprotected sexual activity with unwanted pregnancies and in some cases, possible health risks. This gap needs urgent and proactive policy, and intervention to address this worrisome observation. An acceptable uptake of modern contraceptives requires massive, multi-sectoral and well-coordinated efforts. This is needed to promote and educate sexually active women with their partners on proper use of desired effective modern contraceptive method.

Acknowledgements

We acknowledge the National Population Commission (Nigeria) and ICF International for granting us access to this data.

Competing Interest

The authors declare no competing interest

Authors Contributions

AFF conceived and designed the study, analyzed and wrote the results, partook in writing the introduction and methodology. ASA partook in study design, data analysis, writing the introduction and methodology. OMB partook in study design, data analysis, writing the introduction and discussion. All authors proofread the final version of the manuscript.

Funding

The authors received no funding for this study

Data Sharing

The authors agree to share the data used for this study

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STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	Page
Title and abstract	1	(a) Indicate the study’s design with a commonly used term in the title or the abstract	2
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4-5
Objectives	3	State specific objectives, including any prespecified hypotheses	5
Methods			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6-7
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	6-7
Bias	9	Describe any efforts to address potential sources of bias	6-7
Study size	10	Explain how the study size was arrived at	6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6-7
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	7
		(b) Describe any methods used to examine subgroups and interactions	7
		(c) Explain how missing data were addressed	7
		(d) If applicable, describe analytical methods taking account of sampling strategy	7
		(e) Describe any sensitivity analyses	7
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8
		(b) Give reasons for non-participation at each stage	na
		(c) Consider use of a flow diagram	na
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8
		(b) Indicate number of participants with missing data for each variable of interest	Na
Outcome data	15*	Report numbers of outcome events or summary measures	8
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	10-13
		(b) Report category boundaries when continuous variables were categorized	13

		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	Na
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	10-13
Discussion			
Key results	18	Summarise key results with reference to study objectives	14
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	3,14
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	13-14
Generalisability	21	Discuss the generalisability (external validity) of the study results	15-16
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	16

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

Survival analysis of time to uptake of modern contraceptives among sexually active women of reproductive age in Nigeria

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2015-008371.R2
Article Type:	Research
Date Submitted by the Author:	28-Sep-2015
Complete List of Authors:	Fagbamigbe, Adeniyi; University of Ibadan, Epidemiology & Medical Statistics Adebawale, Ayo; University of Ibadan,, Epidemiology & Medical Statistics MORHASON-BELLO, Imran; University of Ibadan,, Department of Obstetrics & Gynaecology,
Primary Subject Heading:	Public health
Secondary Subject Heading:	Epidemiology, Reproductive medicine, Public health, Sexual health, Research methods
Keywords:	EPIDEMIOLOGY, PUBLIC HEALTH, REPRODUCTIVE MEDICINE, SEXUAL MEDICINE, STATISTICS & RESEARCH METHODS

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Survival analysis of time to uptake of modern contraceptives among sexually active women of reproductive age in Nigeria

***Fagbamigbe, Adeniyi Francis^{1,2}, Adebowale, Ayo Stephen¹, Morhason-Bello, Imran Oludare³**

¹Department of Epidemiology and Medical Statistics, Faculty of Public Health, College of Medicine, University of Ibadan, Nigeria

²School of Research and Postgraduate Studies (SoRPS), Faculty of Human and Social Sciences (HSS), North West University, Mafikeng, South Africa

³Department of Obstetrics and Gynaecology, Faculty of Clinical Sciences, College of Medicine, University of Ibadan/University College Hospital, Nigeria

*** For Correspondence:** *E-mail:* fadeniyi@cartafrica.org; franstel74@yahoo.com *Phone:* +2348061348165 +833500685

For peer review only

Survival analysis of time to uptake of modern contraceptives among sexually active women of reproductive age in Nigeria

Abstract

Objective: To assess the timing of modern contraceptive uptake among married and never married women in Nigeria.

Design: A retrospective cross sectional study

Data and method: We utilized a nationally representative 2013 Demographic and Health Survey data in Nigeria, and modern contraceptive uptake time was measured as period between first sexual intercourse and first use of modern contraceptive. Nonusers of modern contraceptive were censored as of the date of the survey. Kaplan Meier survival curves were used to determine the rate of uptake. Cox-proportional Hazard model was used to determine variables influencing the uptake at 5% significance level.

Participants: A total of 33223 sexually active women of reproductive age

Outcome measure: Time of uptake of modern contraceptive after first sexual intercourse

Results: The median modern contraceptive uptake time was 4 years in never married and 14 years among ever married women. Significant differences in modern contraceptive uptake existed in respondents' age, location, education and wealth status. Never married women were about three times more likely to uptake modern contraceptive than ever married women (aHR=3.24(95%CI:2.82-3.65)). Women with higher education were six times more likely to uptake modern contraceptive than those without education (aHR=6.18(95%CI:5.15-7.42)).

Conclusion: The rate of modern contraceptive uptake is low, and timing of contraceptive uptake during or after first sexual intercourse differed across marital status. While age and number of children ever born influenced modern contraceptive uptake among the never married women, religion and place of residence were associated with the probability of the modern contraceptive uptake among ever married women.

Key words: Marital status, Modern contraceptives uptake, Survival analysis, Women, Nigeria

Strength and Limitation

The strengths of the paper are

- We used a large nationally representative sample to assess duration between time of first sexual activity and time of modern contraceptive uptake as against the usual factors
- We focused on the global target population with high unmet need for family planning
- We used survival analysis method to determine the time wasted before uptake of modern contraceptives
- Same analysis could also be performed in other Sub-Saharan African countries since Demographic and Health Survey data has international similarity. This would provide opportunity to compare policies and response to modern contraceptive uptake in the region.

The limitations are

- We relied on recall of participants to determine time of first sexual activity and modern contraceptive uptake
- It is difficult to give a temporal evidence of explanatory factors considered in the Cox-regression model since the data is cross-sectional.
- We did not use partners' data in the analysis.
- We used secondary data which limits the choice of variables included the analysis.

Survival analysis of time to uptake of modern contraceptives among sexually active women of reproductive age in Nigeria

Background

Contraception is regarded as one of the cheapest and effective strategy to promote sound reproductive health¹⁻³. This is why governments and international agencies are making frantic efforts to ensure that individuals within childbearing age have unhindered access to modern contraceptive commodity. The predominantly high fertility rates in developing countries⁴ especially in sub-Saharan Africa is not disconnected from low contraceptive use^{2,5}. The effect of high fertility on women and family is enormous. Apart from maternal depletion syndrome and its attendants problems, contraceptive also prevents unwanted pregnancies, thereby lowering unsafe abortion and maternal mortality. The economic pressure of managing large family size coupled with overwhelming associated health complications of such is a pointer for embracing modern contraception in Nigeria⁶.

The current maternal mortality ratio (MMR) in Nigeria is 576 per 100,000 live births⁷. One in three women give birth before age 20, and also, pregnancy related morbidity and mortality rates are also high among this group. One quarter of the estimated 20 million unsafe abortions and 70,000 abortion related deaths each year occur among women aged 15-19 years. Similarly the risk of dying during childbirth in this age group doubled those aged 20 years and above.⁸. An estimated fourteen million unwanted pregnancies occur yearly, with almost half in women aged 15-24 years in sub – Saharan Africa⁹. In addition, 16% of the currently married women in Nigeria have unmet need for family planning⁷. This is slightly lower than 20% reported in 2008¹⁰. Modern contraception is one of the primary prevention of maternal deaths and it could also prevent 90 percent of abortion related morbidity and mortality¹.

Nigeria, the most populous black nation has witnessed sporadic increase in population growth in the last two decades¹¹. In 1990, the population was slightly above 80 million and this has increased to 170 million in 2013¹². Consequently, the high increase in population growth combined with low contraceptive use in Nigeria prompted the Federal Government to institute policies at different times aimed at reducing the population growth rate. For instance, the National Policy on Population for Development was launched in 1988¹³ and was revised in 2004¹⁴. However, a review of the policies identified low use of modern contraceptive as barrier towards its effectiveness¹⁵. The reviewed policy was intended to overcome the shortcomings of the earlier policy and ensure increase in contraceptive use nationwide.

Modern contraceptive uptake in the developing countries is generally lower than developed countries¹⁶. Worldwide, the Contraceptive use Prevalent Rate (CPR) is 56 percent. The CPR in developed countries is 62% while it is 54% in less developed nations and 28% in least developed nations. In Africa, the CPR is 26% and 20% in sub-Sahara Africa. Nigeria and her

neighbouring countries have about 10 percent modern contraceptive uptake value ⁴. Nigeria has a total fertility rate of 5.6, the growth rate is 2.5% per annum and the CPR is less than 10.0% ^{7,11}.

Previous studies have identified socio-demographic differentials in contraceptive use. Among factors identified in these studies are age at first sexual intercourse, religion, education, place of residence, and economic status ^{2,5,7,17}. The reproductive choices of young adults has also been found to have a great impact on their schooling, health and ultimately, transition to adulthood ^{18,19}. In particular, early child bearing has been attributed to higher rates of maternal and child mortality, truncated education, larger family sizes, which in turn, lead to increase in population ²⁰.

Knowledge of family planning methods is 85% but the uptake is less than 15% ^{7,21}. The most common modern contraceptives among women are the pill (71%), injectables (68%), and the male condom (67%) whereas male condom (91%), the pill (65%), and injectables (60%) are the most common methods among men. While 15% of currently married women use any method of contraception, only 10% use a modern method of family planning ⁷. The reasons why high knowledge of family planning methods has failed to translate to high uptake remain a great concern to government and researchers in Nigeria.

In Nigeria, the national surveys have revealed that median timing of first sexual intercourse is below 18 years ^{7,21}. This is the age when adolescents are most susceptible to sexually transmitted infections including HIV/AIDS and human papillomavirus, and other health complications. Unfortunately, in Nigeria context, cultural beliefs do not support discussion on reproductive issues including the use of modern contraceptive among young individuals². People see young women who demand for contraceptive as promiscuous and as a result either choose not to use or rely on their male sexual partners who are likely to be older or their peers ²¹. Where such provisions are not available, young women have sex without the use of any contraception or make use of traditional method which is often not effective ³. Thus teenage pregnancy, early marriage or single parenthood may be the end result. Due to shame attached to premarital pregnancy in Nigeria, unmarried women are expected to protect themselves from such embarrassment³. Equally, the married are expected to use modern contraceptive to guard against unwanted pregnancies in marriage^{22,23}. In this regard, we argue that the timing of uptake of modern contraceptive might be different among women in marital union and those never married. This differential in timing of contraceptive uptake by marital status is yet to be adequately documented in Nigeria.

Literature is replete on the prevalence and factors influencing contraceptive use ^{3,22-25} but there is little or no robust analysis on time to uptake of modern contraceptives among sexually active women at the national level in Nigeria. This study was designed to model the time it takes sexually active women in Nigeria to begin the use of modern contraceptives after the first sexual experience, and also, to identify factors influencing the uptake. The objectives were conceived

with the view to providing information that will be useful for effective family planning programming in Nigeria.

Methods:

We used the data collected during the 2013 Nigeria Demographic and Health Survey (NDHS). The sample was nationally representative that covered the entire population residing in non-institutional dwelling units in the country. The survey used the list of enumeration areas (EAs) prepared for the 2006 Population Census in Nigeria as a sampling frame. This was provided by the National Population Commission. The sample was designed to provide population and health indicator estimates at the national, zonal, and state levels. The sample design allowed for specific indicators to be calculated for each of the six zones, 36 states, and the Federal Capital Territory, Abuja.

Administratively, Nigeria is divided into 36 states and Federal Capital territory (Abuja). Each state is subdivided into local government areas (LGAs), and each LGA is divided into localities. There are 774 LGAs in the country. In addition to these administrative units, during the 2006 population census, each locality was subdivided into census enumeration areas. The primary sampling unit (PSU), referred to as a cluster in the 2013 NDHS, is defined on the basis of EAs from the 2006 EA census frame. The 2013 NDHS sample was selected using a stratified three-stage cluster design consisting of 904 clusters, 372 in urban areas and 532 in rural areas. A representative sample of 40,680 households was selected for the survey, with a minimum target of 943 completed interviews per state. A fixed sample take of 45 households were selected per cluster. All women age 15-49 who were either permanent residents of the households in the 2013 NDHS sample or visitors present in the households on the night before the survey were eligible and were interviewed. A total of 39,902 women age 15-49 were identified as eligible for individual interviews, and 98 percent of them were successfully interviewed. Of the 38,948 respondents interviewed, 33,223 (85.3%) had had sex. Further analysis of modern contraceptive uptake were therefore based on the information provided by this respondents.

Among others, the women were asked questions on their background characteristics (age, religion, education, literacy, media exposure, etc.), reproductive history and childhood mortality, knowledge, source, and use of family planning methods. Time to uptake of modern contraceptive since first sexual intercourse (sexual initiation) was used as dependent variable. Age, region, education, religion, residence, husbands' education, children everborn, wealth status and marital status are among socio-demographic factors identified in previous studies as determinants of modern contraceptive use^{2,3,5,17,22-25}. The theoretical rationale for including these factors include differentials in modern contraceptive availability in location (rural/urban) and geographical zones, affordability (wealth), knowledge (education), confidence to buy (age) etc. Details have also been documented^{3,5,17,24,25}. The time to uptake of modern contraceptive was computed as the time (years) difference of current age (v012) and age at first sexual intercourse (v531) for

nonusers and censored accordingly. For respondents using modern contraceptive, the time to uptake of modern contraceptive was computed as time difference between year of uptake of modern contraceptive and age at sexual initiation. Women who never had sexual intercourse were excluded from the study.

Considering the possibility of a woman uptaking modern contraceptive before marriage and been currently married as at the time of the survey, it would have been more desirable to use “time to uptake of modern contraceptives after marriage” as response variable for the married women. There is no variable in the data set that we could use to define “time to uptake after marriage”. Nevertheless, we used alternatives that could reasonably approximate time to uptake of modern contraception among the married women. Time to modern contraceptive uptake was modeled using a discrete-time duration model. The survival time is assumed to begin at the time a woman had her first sexual intercourse until the time she started using modern contraceptives. The survival time is censored for sexually active women who has never used modern contraceptive as of the time of the survey. The duration from first sexual intercourse to modern contraceptive uptake, “*T*”, is assumed to be a discrete random variable that takes on only positive integer. The populations at risk are all sexually active women involved in the study. The observation continues until time “*t*”, at which the event of interest, uptake of modern contraceptive, occurs or the time to the end of the study when observation is censored in 2013, the year of the survey, if the individual has not uptake modern contraceptive. The study ends for an individual at time “*T* = *t*” if she had started using modern contraceptive. Two quantitative terms were used in this study. These are; the survivor function *S*(*t*) and hazard function *h*(*t*). The survivor function gives the probability that a person survives longer than some specified time *t* without uptaking modern contraceptive, while the hazard function gives the instantaneous potential per unit time for modern contraceptive to be uptaken, given that the individual modern contraceptive uptaking time survived up to time *t*. Survival and hazard function are mathematically denoted by

$$S(t(j-1)) = \prod_{i=1}^{j-1} P(T > t_{(i)} | T \geq t_{(i)}) \dots\dots\dots (1)$$

and

$$h(t) = \frac{P(t \leq T < t + \Delta t | T \geq t)}{\Delta t} \dots\dots\dots (2)$$

respectively.

The Cox-proportional Hazard model was used to predict the strength of the relationship between each the selected independent variables and censored timing of modern contraceptive uptake. The Cox model is usually in terms of hazard model which gives an expression for the hazard at time *t* for an individual with a given specification of a set of independent denoted by “*X*” which are predictor variables that is being modeled to predict individuals’ hazard. The Cox proportional

hazards regression assumes the relationship for one covariate where $h_0(t)$ is the baseline hazard function, x_i are the covariates and β_i are the coefficients.

$$h(t; x) = h_0(t) \exp(x\beta) \quad \dots\dots\dots (3)$$

We also stratified Cox regression estimates. In the stratified estimator, the hazard at time t for a subject in group i is assumed to be

$$h_i(t) = h_{i0}(t) \exp(\beta_1 x_{i1} + \dots + \beta_k x_{ik}) \quad \dots\dots\dots (4)$$

That is, the coefficients are assumed to be the same, regardless of group, but the baseline hazard can be group specific. In our stratified Cox analysis, we tested whether the proportional-hazards assumption was violated using the significance of the hazard ratios and the Wald chi square statistics. Variables significant in the bivariate cox regression were used in the multiple cox regression to assess association with outcome variable while controlling for confounders. Sampling weights were applied in our analysis. The weighting was based on the sampling fractions derived from the sample size and the total population of each state constituting Nigeria. Statistical significance was determined at $p\text{-value} = 0.05$. We used the Stata (version 13) statistical analysis software for the analysis.

Ethical Approval:

Ethical approval was sought from Nigeria National Health Research Ethics Committee by the data originators and granted before the commencement of the survey. Also, informed consents were received from the participants before responding to questions used during the survey. We obtained the approval from measure DHS for permission to use the data prior to analysis.

Results

Of the 38,948 respondents, 85.3% had had sex. Mean age of sexual debut was 14.31 (95% CI = 14.24-14.38) with a range of 8-46 years. About three fifths (57.9%) of the respondents were from rural areas, 37.8% had no education, 20.1%, 17.4% and 18.3% aged 15-19, 20-24 and 25-29 years respectively. Only 42.6% of respondents aged 15-19 years had had sex. Only 11.4% of the sexually active respondents were currently using modern contraceptive. Highest use of modern contraceptive was found among respondents aged 20-24 years, 27.2% in the South West, 16.8% in urban areas 26.5% among respondents with higher educational attainment 18.7% among women in richest wealth quintiles, 15.8% among never married and 9.9 % among ever married women. The median year to uptake of modern contraceptive was 4years, 14 years and 13 years among the never married women, ever married women and all sexually active women respectively.

Table 1: Distribution of respondents by socio-demographic characteristics, sexual activities, modern contraceptive use and median year to uptake of modern contraceptive

Variable	Category	N=38948 (%)	% who had ever had sex	% using MC among SAW^	Median time of up taking MC		
					Never Married Women	Ever Married Women	Both
Age Group	15-19	20.1	42.6	12.7	2	3	2
	20-24	17.4	86.6	16.0	3	6	5
	25-29	18.3	97.0	13.2	6	10	10
	30-39	14.0	99.2	13.6	12	17	16
	40-49	12.1	99.8	11.2	22	27	27
Region	North Central	14.3	81.7	16.5	3	12	11
	North East	14.8	88.4	3.8	3	14	13
	North West	30.5	90.3	3.3	3	14	14
	South East	11.5	78.7	17.9	3	15	13
	South South	12.7	84.4	21.9	4	15	12
Residence	South West	16.2	83.1	27.2	3	14	12
	Urban	42.1	80.3	20.9	4	14	12
	Rural	57.9	85.3	8.8	3	14	13
Wealth Index	Poorest	18.7	91.3	3.2	3	14	14
	Middle	19.2	83.7	12.6	3	14	13
	Richest	21.6	81.0	23.3	4	13	12
Highest Education Level	No education	37.8	95.9	2.0	4	15	15
	Primary	17.3	91.5	13.2	4	16	15
	Secondary	35.8	71.3	22.7	3	11	9
	Higher	9.1	88.0	30.1	5	12	10
Husband's Highest Educ Level	No education	38.8	100.0	2.1	na	15	15
	Primary	18.4	100.0	10.9	na	15	15
	Secondary	28.1	100.0	14.7	na	12	12
	Higher	13.7	100.0	18.9	na	13	13
Religion	Catholic	11.1	80.1	20.9	4	14	12
	Other Xtian	35.7	82.6	21.8	4	14	12
	Islam	51.7	88.5	5.3	2	13	13
	Traditionalist	0.9	90.3	4.7	3	18	18
Marital status	Never Married	23.9	41.6	38.0	4	na	4
	Ever Married	76.1	100.0	9.9	na	14	14
Children Ever born	No Birth	29.1	50.0	24.4	3	3	3
	1-2 Births	21.9	100.0	10.1	5	6	6
	3-4 Births	19.7	100.0	13.0	13	12	12
	>4 Births	29.3	100.0	10.4	19	21	21
Total	Total	100.0	85.3	13.3	4	14	13

^n=33223 MC modern contraceptive

At the year of sexual initiation 79.4% of never married women and 5.2% of ever married women used modern contraceptive; 40.6% versus 7.3% during the second year; and 34.4% versus 12.0% during third year etc. The proportion fell among never married women as the year from sexual initiation increased but it rose gently among ever married women to its peak at about 17th year of sexual activities where it remain the same without overall proportion of modern contraceptive users among all women. Proportions using modern contraceptive within each group were about the same between the 12th and 17th year of sexual activities (Figure 1).

Over two fifths (41.5%) of the modern contraceptive users were currently using male condoms, 22.3% used Injections, 17.2% were on pills, 6.9% on IUD while less than one percent each used Female condoms, diaphragm, foam, and male sterilization (data not shown). In Figure 2, we compared the rate of modern contraceptive uptake among sexually active women by marital status. The rate of modern contraceptive uptake among the never married women was higher than among ever married women.

Figure 3 shows the probabilities of modern contraceptive uptake among the never married women according to their socio-demographic characteristics. Considering age, never married women aged 20-24 years had higher chances than other never married women to uptake modern contraceptive as they progressed in the years of sexual activities. Similarly, never married women in urban areas and within the highest wealth quintiles had highest probabilities of uptaking modern contraceptive.

In Figure 4, the probabilities of modern contraceptive uptake among the ever married women according to their socio-demographic characteristics were shown. Ever married women in the South West region had highest likelihood of up taking modern contraceptive than ever married women from other regions as they progressed in their years of sexual activities. Also, ever married women who were either Catholics or practicing other Christian faith had higher probability of modern contraceptive uptake than other ever married women as years of sexual activities progresses.

The unadjusted hazard ratio showed that chances of a never married woman to uptake modern contraceptive reduced by 7% for every additional year after sexual initiation. Those aged 20-24 years are 42% more likely to uptake modern contraceptive than never married women aged 15-19 years ($HR=1.42(95\% CI: 1.14-1.77)$). Never married women from North East zone were 31% times less likely to uptake modern contraceptive than their counterparts from North Central ($HR=0.69 (95\% CI: 0.45-1.04)$). On wealth status, never married women in richest wealth quintile are more over twice likely to uptake modern contraceptive than never married women in poorest wealth quintile while those in having secondary ($HR=7.14 (95\% CI: 2.67-19.11)$) or higher ($HR=7.88(95\% CI: 2.93-21.16)$) education were over seven times more likely to uptake modern contraceptive than those without any formal education (Table 2). Among the ever married women, those from south west were about 40% more likely to uptake modern contraceptive than those from the North Central ($HR=1.42(95\% CI:1.25-1.58)$) and over 80% times less likely in the North East ($HR=0.20 (95\% CI:0.17-0.24)$).

In the multivariate analysis, the adjusted Hazard Ratio (aHR) shows that never married woman aged 20-24 years to uptake was 31% higher than a never married woman aged 15-19 years ($aHR=1.31(95\% CI:1.05-1.63)$) while never married woman with 1 or 2 births were 22% times less likely to uptake modern contraceptive than those with no previous birth ($aHR=0.78(95\% CI: 0.65-0.93)$). Ever married women who practiced Islam were 42% times less likely to uptake

modern contraceptives compared with their counterparts practising Catholic religion (aHR=0.58 (95% CI:0.49-0.67)). After controlling for other variables a sexually active woman with higher education in Nigeria were six times more likely to uptake modern contraceptive than those without any formal education (aHR=6.18(95% CI:5.15-7.42)) just as rural women were 17% less likely to uptake modern contraceptive than the urban sexually active women (aHR=0.83(95% CI: 0.76-0.90) as shown in Table 3.

Table 2: Unadjusted Determinants of modern contraceptive uptake among the women

Characteristics	Categories	Unadjusted of determinants of modern contraceptive uptake		
		Never Married HR(95% CI)	Ever Married HR(95% CI)	Both HR(95% CI)
Marital Status	Never Married			10.1(9.2-11.0)*
	Ever Married			Reference
Age(years)+		0.93(0.92-0.94)*	0.89(0.88-0.90)*	0.88(0.87-0.88)*
Age Group	15-19	Reference		
	20-24	1.42(1.14-1.77)*	1.40(0.94-2.10)	0.99(0.82-1.20)
	25-29	1.08(0.86-1.37)	0.68(0.45-1.01)	0.46(0.38-0.55)*
	30-39	0.37(0.27-0.50)*	0.29(0.19-0.43)*	0.16(0.13-0.19)*
	40-49	0.12(0.06-0.25)*	0.10(0.06-0.14)*	0.05(0.04-0.06)*
Region	North Central	Reference		
	North East	0.69(0.45-1.04)	0.20(0.17-0.24)*	0.22(0.18-0.25)*
	North West	2.04(1.38-3.03)*	0.15(0.13-0.18)*	0.16(0.14-0.19)*
	South East	1.22(0.94-1.57)	0.56(0.49-0.65)*	0.80(0.70-0.90)*
	South South	1.43(1.14-1.80)*	0.80(0.71-0.90)*	1.11(1.00-1.23)*
	South West	1.61(1.25-2.07)*	1.42(1.28-1.58)*	1.47(1.34-1.62)
Residence	Urban	Reference		
	Rural	0.80(0.69-0.92)*	0.38(0.35-0.41)*	0.39(0.37-0.42)*
Wealth Index	Poorest	Reference		
	Middle	1.7(1.23-2.35)*	3.69(3.19-4.28)*	4.00(3.50-4.57)*
	Richest	2.4(1.79-3.21)*	8.09(7.14-9.17)*	8.52(7.60-9.56)*
Highest Education	No education	Reference		
	Primary	3.36(1.21-9.33)*	6.39(5.51-7.40)*	6.59(5.70-7.62)*
	Secondary	7.14(2.67-19.1)*	13.1(11.4-15.1)*	15.8(13.8-18.1)*
	Higher	7.88(2.93-21.2)*	14.4(12.3-16.8)*	18.9(16.3-21.9)*
Religion	Catholic	Reference		
	Other Xtian	1.01(0.85-1.21)	1.18(1.05-1.33)*	1.11(1.00-1.22)*
	Islam	1.09(0.81-1.46)	0.31(0.28-0.36)*	0.25(0.22-0.28)*
	Traditionalist	0.96(0.13-6.85)	0.28(0.16-0.48)*	0.23(0.14-0.38)*
Children Ever born	No Birth	Reference		
	1- 2 Births	0.73(0.61-0.86)*	5.48(3.80-7.91)*	0.47(0.42-0.52)*
	3- 4 Births	0.31(0.15-0.66)*	3.72(2.58-5.35)*	0.30(0.27-0.34)*
	>4 Births	0.15(0.02-1.08)	1.43(0.99-2.06)	0.13(0.11-0.14)*

* Significant at 5% p-value +treated as continuous variable HR Hazard Ratio CI Confidence Interval

Table 3: Adjusted Determinants of modern contraceptive uptake among the women

Variable	Categories	Adjusted of determinants of modern contraceptive uptake		
		Never Married HR(95% CI)	Ever Married HR(95% CI)	Both HR(95% CI)
Marital Status	Never Married			3.21(2.82-3.64)*
	Ever Married			Reference
Age(years)+		0.91(0.89-0.92)*	0.84(0.83-0.85)*	0.84(0.83-0.85)*
Age Group	15-19			
	20-24	1.31(1.05-1.63)*	0.75(0.50-1.12)	0.94(0.78-1.14)
	25-29	0.89(0.70-1.14)	0.26(0.17-0.38)*	0.38(0.31-0.46)*
	30-39	0.28(0.20-0.39)*	0.08(0.05-0.12)*	0.11(0.09-0.13)*
	40-49	0.10(0.05-0.20)*	0.02(0.01-0.03)*	0.03(0.02-0.04)*
Region	North Central			
	North East	0.86(0.56-1.31)	0.41(0.34-0.49)*	0.46(0.39-0.54)*
	North West	2.49(1.67-3.71)*	0.4(0.33-0.47)*	0.47(0.40-0.55)*
	South East	1.47(1.12-1.92)*	0.39(0.34-0.46)*	0.55(0.48-0.62)*
	South South	1.58(1.24-2.02)*	0.49(0.43-0.56)*	0.68(0.61-0.75)*
	South West	1.41(1.08-1.83)*	0.94(0.84-1.05)	1.06(0.95-1.17)
Residence	Urban			
	Rural	0.97(0.83-1.14)	0.8(0.73-0.88)*	0.83(0.76-0.90)*
Wealth Index	Poorest			
	Middle	1.41(1.01-1.97)*	1.72(1.47-2.02)*	1.71(1.49-1.98)*
	Richest	1.84(1.33-2.54)*	2.32(1.98-2.71)*	2.19(1.90-2.53)*
Highest Education	No education			
	Primary	2.88(1.03-8.03)*	3.17(2.69-3.74)*	3.29(2.80-3.87)*
	Secondary	4.47(1.66-12.1)*	4.46(3.76-5.29)*	4.90(4.16-5.78)*
	Higher	5.46(2.00-14.9)*	5.57(4.59-6.76)*	6.18(5.15-7.42)*
Religion	Catholic			
	Other Xtian	0.95(0.79-1.15)	0.93(0.82-1.05)	0.94(0.85-1.05)
	Islam	1.14(0.83-1.56)	0.58(0.49-0.67)*	0.60(0.52-0.69)*
	Traditionalist	0.74(0.10-5.36)	0.67(0.39-1.15)	0.67(0.40-1.12)
Children Ever born	No Birth			
	1- 2 Births	0.78(0.65-0.93)*	3.46(2.40-4.99)*	0.58(0.52-0.65)*
	3- 4 Births	0.49(0.23-1.04)	3.58(2.48-5.17)*	0.60(0.53-0.68)*
	>4 Births	0.48(0.07-3.56)	3.40(2.35-4.93)*	0.60(0.52-0.68)*

* Significant at 5% p-value +treated as continuous variable aHR adjusted Hazard Ratio CI Confidence Interval

Discussion

Modern contraceptive is an effective method to prevent unplanned pregnancy and some other associated health complications of unprotected sexual activity such as HIV, HPV infection and STIs²⁶. Uptake of modern contraceptive method is often measured and compared across different settings, and it is sometimes used as proxy indicator for burden of unprotected sexual activity and unplanned pregnancy²⁷. In this study, the average national modern contraceptive uptake among sexually active women was 11.4 percent. The uptake is highest among those aged

20 to 24 years, resident in southwest, living in urban community, and with highest education and wealth quintiles. The shortest interval to uptake modern contraception was four years after initiation of sexual activity, and this was understandably among never married women. This interval is more than 3 times shorter than the ever married women. The proportionate trend of those that used modern contraception by unit change of year from point of sexual initiation nosedive in the never married women, and thereafter, plateau after 17 years. On the contrary, there was a steady rise among the ever married till 17years after sexual initiation. Both groups however had similar proportion of contraceptive uptake at 17 years after sexual initiation.

The general low level of modern contraceptive uptake in Nigeria remained a source of concern especially among the sexually active women. Though the average uptake now is marginally higher than 2008 DHS¹⁰ but this is not commensurate with the investment on family planning in the country within the period¹⁰. Unlike the previous published articles on modern contraception in Nigeria, this analysis modelled time interval between sexual initiation and uptake of contraception using a nationally representative data.

The lessons derivable are in manifold. First, there is a lag period of at least four years averagely before access to modern contraception among sexually active women in Nigeria. This could possibly be due to either lack of awareness or access to contraceptive commodities and its services. Second, age long factors such as regional variations, urban-rural divide, wealth indices, and education that had been associated with uptake of modern contraception; are still significant in this analysis^{22,23,25}. The low contraceptive uptake in Northern Nigeria is responsible for a comparative upsurge in several family planning interventions in this region than others²⁴ Despite this effort, Southern regions still have a higher modern contraception uptake among the sexually active women. The known associated factors responsible for the poor uptake in Northern Nigeria are education, socio-cultural disposition and interpretation of modern contraception^{28,29}. Some have argued that Northern regions of the country still have a conservative disposition towards modern contraceptive methods of family planning²⁸. This was buttressed with an evidence of a fairly higher awareness of family planning and use of traditional or unorthodox methods and high fertility rates among women in the north²⁴.

Another interesting finding is that some factors that are associated with the probability of modern contraceptive uptake differed by marital status. Women aged 20 – 24 were 31 percent more likely than those younger, and those that already had one or two previous child were less likely than those without in the never married category. This might suggest differential preference and need as well as awareness about implication of unprotected sexual activity among the two population of women³⁰. Elsewhere, young adults are often reported to engage in safer sexual activity than the adolescents³¹. Within the ever married group in this study, religion and place of residence were associated with the probability of the modern contraceptive uptake. Women of

Catholic faith were more likely than those that professed Islamic religion. This observation did not align with the widely known perception of Catholic worshipers and modern contraception^{31,32}. This will require further studies especially social science research that might provide better insight on the motivation to use modern contraception among Catholic contrary to their doctrine.

It is fascinating that the proportions of those uptaking modern contraception among “never” and “ever” married groups is the same at 17 years post-sexual initiation. This is despite each group having different proportional trend from the point of sexual initiation. It might suggest that women at this particular time have similar reproductive and sexual intentions. Seventeenth year within the reproductive year is most likely above an average age for childbearing and also probably close to the peri-menopausal age within Nigerian setting^{33,34}. This has technically removed the observed age difference of the respondents.

The observed ‘lag period’ in this analysis might be a pointer that access to modern contraceptive in the early reproductive life of women is poor. Incidentally, this period is also the age range of adolescent and young adults. Although, Nigerian Government have implemented several programmes including family life education or sexuality education to educate and promote safer sexual practices among adolescents and young adults, but the family planning component did not receive much attention³⁵. The programme suffered neglect largely due to concern of government on fears expressed by parents/guardian and religious leaders that early introduction of family planning interventions to youth might encourage sexual activity³⁵. Whereas, in some developed countries, young people have unhindered access to modern contraception messages and services, and this has helped to avert the consequences of unplanned pregnancy and sexually transmitted infections³⁶. Apart from this factor, there are no specialized centers owned by government in Nigeria where young people could access modern contraception freely³⁷. Rather, only very few non-governmental organizations have youth centers in some states to offer this service. It is therefore important for policy makers to design cultural sensitive interventions that will promote access to effective modern contraception which could potentially reduce the unmet need of family in this critical ‘lag period’. There should be renew energy to proactively invest on this unmet need to address the associated challenges of unprotected sexual activity.

It is pertinent to note that our findings have some limitations. The DHS data cannot replace census in its entirety and as such, there might still be some variations in the observed response. The question on age of sexual initiation is prone to recall bias and sometimes, the veracity of information provided could be challenged. There is a concern that sexual initiation question could be emotive and this might not elicit correct response. This is one of the reasons why some developed countries have separated sexual health survey from other reproductive health survey^{38,39}. In addition, they also adopted alternative techniques such as audio computer assisted self-interview or other self-administered methods to maintain privacy and confidence to sexual activity questions³⁸. It will also have been important to analyse the role of respondents’ sexual partners in the uptake.

Despite all these limitations, this study have significant message to show for family planning policy and programming in Nigeria. First, the analysis vividly showed that a large proportion of women in Nigeria are not using effective contraceptive method during their early sexual life. This is the period where sexual adventure and liberality is common with attendant health, social and psychological problems^{40,41}. Second, the regional variations and other relevant factors will assist policy makers to identify gaps on current family planning programmes and also guide the development partners to identify critical population within the sexually active group for their interventions.

Conclusions

This study shows that modern contraceptive uptake among sexually active population of women in Nigeria is very low and there is a huge window of period where they engage in unprotected sexual activity which often result in unwanted pregnancies and in some cases, possible health risks. This gap needs urgent and proactive policy, and intervention to address this worrisome observation. An acceptable uptake of modern contraceptives requires massive, multi-sectoral and well-coordinated efforts. This is needed to promote and educate sexually active women with their partners on proper use of desired effective modern contraceptive method.

Acknowledgements

We acknowledge the National Population Commission (Nigeria) and ICF International for granting us access to this data. The authors acknowledge the technical support received from the Consortium for Advanced Research Training in Africa (CARTA). AFF is a CARTA fellow and he received training in research conception and manuscript writing.

Competing Interest

The authors declare no competing interest

Authors Contributions

AFF conceived and designed the study, analyzed and wrote the results, partook in writing the introduction and methodology. ASA partook in study design, data analysis, writing the introduction and methodology. IOMB partook in study design, data analysis, writing the introduction and discussion. All authors proofread the final version of the manuscript.

Funding

The authors received no funding for this study

Data Sharing

No additional data available.

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Figure 1: Proportions of sexually active women up-taking MC by years of sexual activities and marital status

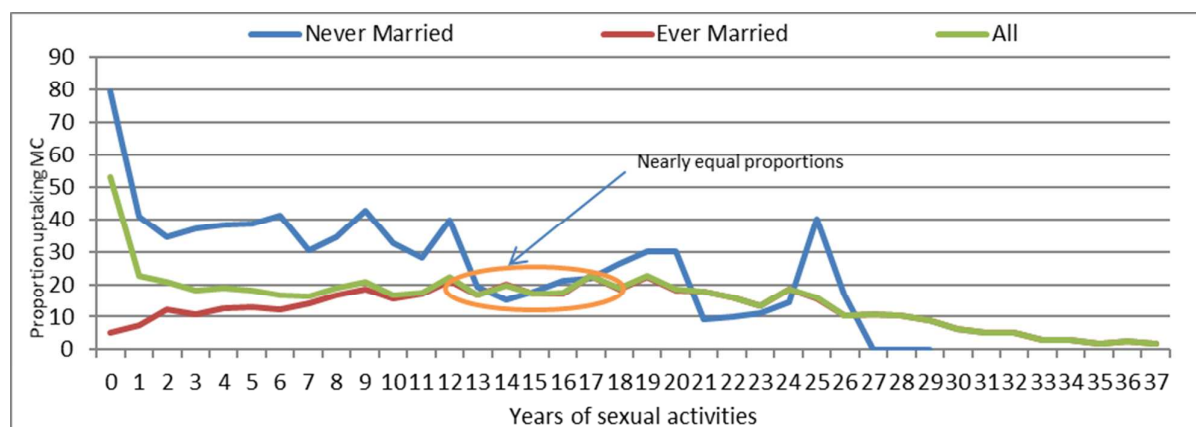


Figure 2: Survival analysis of MC uptake among all respondents by Marital Status

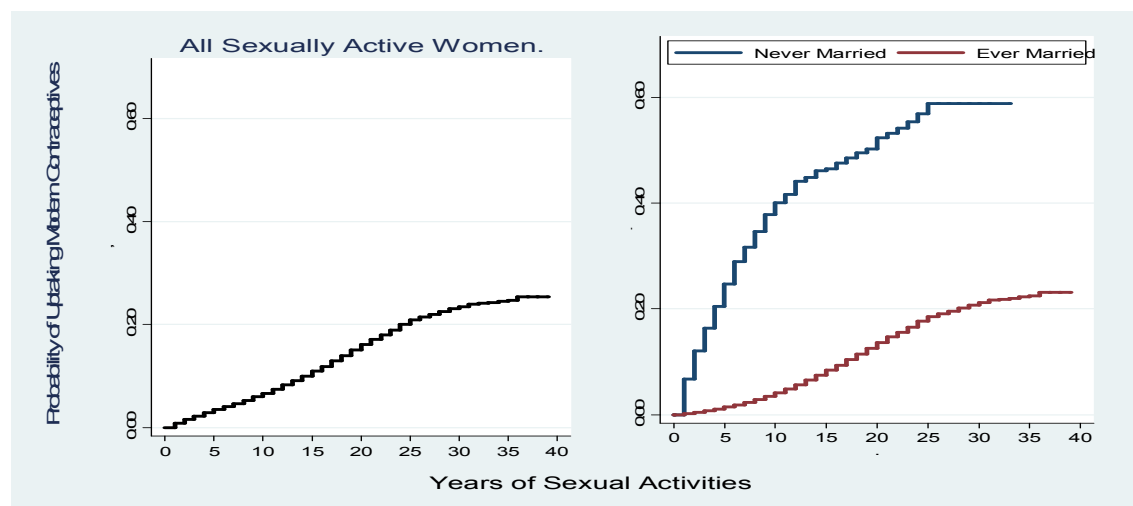


Figure 3: Probabilities of MC uptake among Never married women according to some selected socio-demographic characteristics

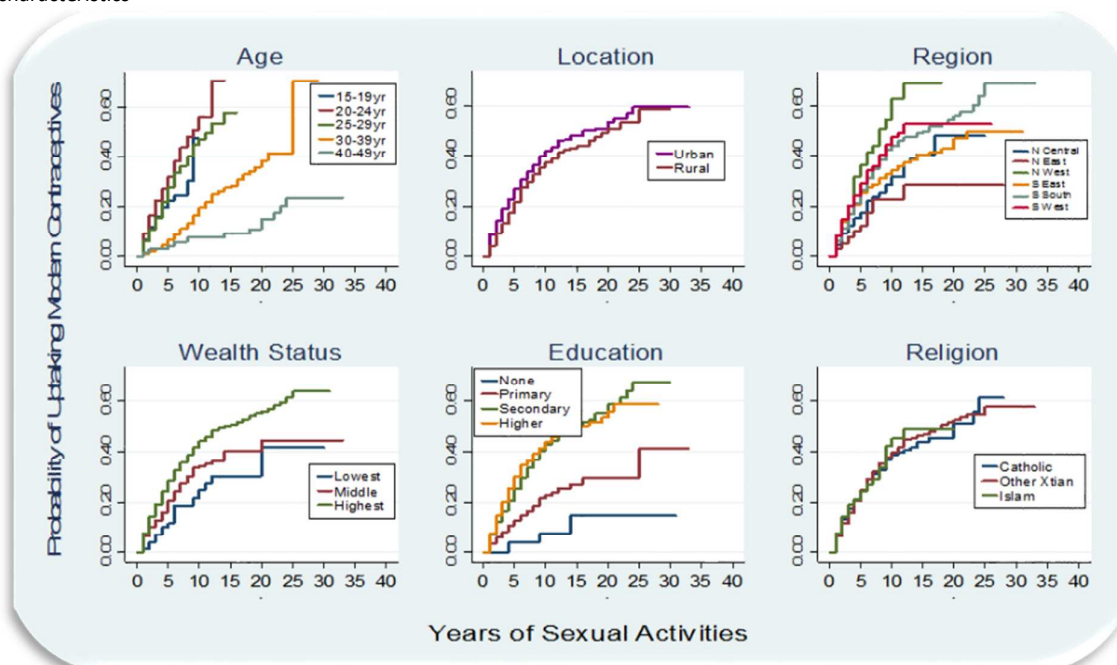
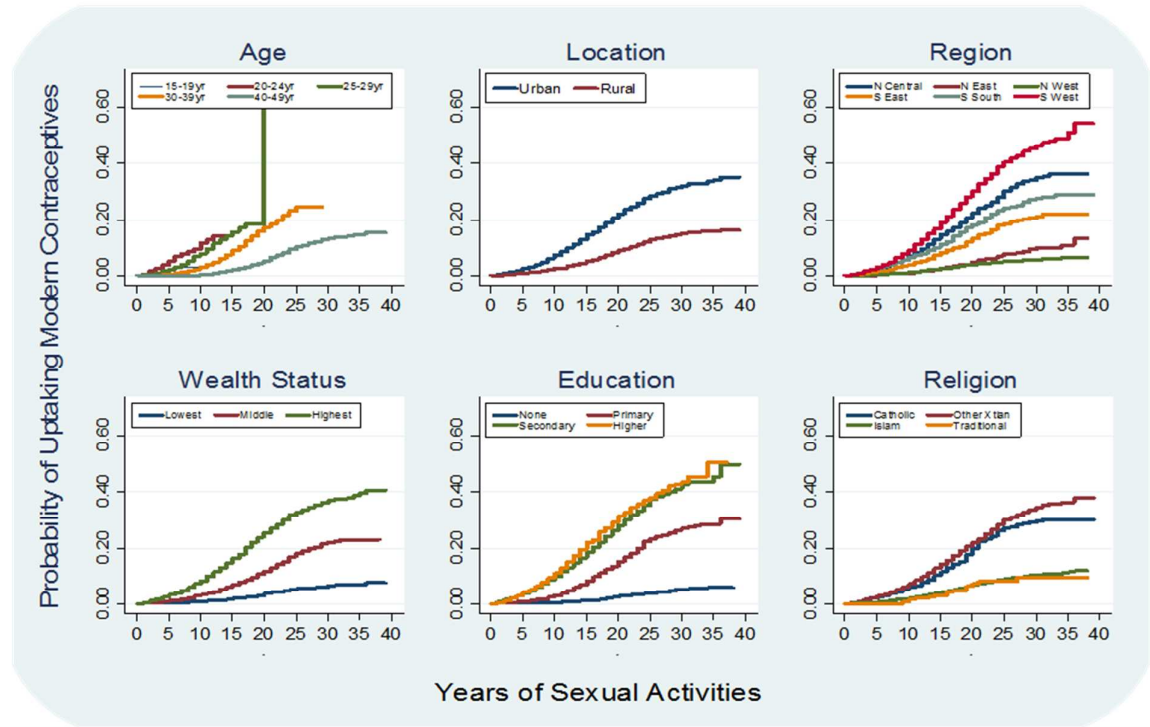


Figure 4: Probabilities of MC uptake among Ever married women according to some selected socio-demographic characteristics



STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	Page
Title and abstract	1	(a) Indicate the study’s design with a commonly used term in the title or the abstract	2
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4-5
Objectives	3	State specific objectives, including any prespecified hypotheses	5
Methods			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6-7
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	6-7
Bias	9	Describe any efforts to address potential sources of bias	6-7
Study size	10	Explain how the study size was arrived at	6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6-7
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	7
		(b) Describe any methods used to examine subgroups and interactions	7
		(c) Explain how missing data were addressed	7
		(d) If applicable, describe analytical methods taking account of sampling strategy	7
		(e) Describe any sensitivity analyses	7
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8
		(b) Give reasons for non-participation at each stage	na
		(c) Consider use of a flow diagram	na
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8
		(b) Indicate number of participants with missing data for each variable of interest	Na
Outcome data	15*	Report numbers of outcome events or summary measures	8
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	10-13
		(b) Report category boundaries when continuous variables were categorized	13

		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	Na
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	10-13
Discussion			
Key results	18	Summarise key results with reference to study objectives	14
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	3,14
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	13-14
Generalisability	21	Discuss the generalisability (external validity) of the study results	15-16
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	16

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.