

Modeling the Determinants of Fertility among Women of Childbearing Age in Nigeria: Analysis Using Generalized Linear Modeling Approach

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Abstract

Apart from proximate determinants, certain sociodemographic factors have been reported to inform fertility in some developing nations but a comprehensive report for Nigeria is lacking in the literature. This study tested effects of some determinants of fertility on the level of fertility in Nigeria using data from the 2008 Nigerian Demographic Health Survey (NDHS). Data on 20,974 women were extracted from the 2008 NDHS data and analyzed using descriptive statistics and Poisson regression. Women with no education and those with secondary school education had 1.36 times risk and 17% increases in fertility (respectively) over those with higher education. Rural women were 1.02 times more likely to be at risk of high fertility compared to women in urban areas. Fertility level in Nigeria is higher in the rural areas than in the urban areas while level of education of women negatively impacted on their risk of having high fertility.

Keywords: Fertility rate, Generalized linear models, Poisson regression, Nigeria, Women, childbearing

1. Introduction

Average number of children that would be born per woman if all women lived to the end of their childbearing years and bore children according to a given fertility rate at each age is not only a more direct measure of the level of fertility (since it refers to births per woman) but also an indicator of the potential for population change in the country¹. According to CIA¹, a rate of two children per woman is considered the replacement rate for a population, resulting in relative stability in terms of total numbers while rates above two children indicate populations growing in size and whose median age is declining. Although higher rates may indicate difficulties for families, in some situations, to feed and educate their children and for women to enter the labor force, rates below two children indicate populations decreasing in size and growing older.

Nevertheless, according to the 2011 estimates by the Central Intelligence Agency (CIA), Total Fertility Rate (TFR) in Nigeria was 4.73- rated 27th in the world and 25th in Africa immediately after Sudan and Senegal but ahead of Togo, Central Africa Republic and Gabon (in that order). In addition, according to the results of the 2008 census, Nigeria is the most populous black nation in the world with a total population of over 140million people and an annual population growth rate of 3.2%²⁻⁴. These statistics are obviously indicator of impending population explosions if measures for checks are not considered.

Although in Nigeria, the more children a woman (or a couple) is able to procreate, the matrimonially fulfilled the culture considers her, it is said that less developed countries like Nigeria could only grow economically if population growth is held in check⁵⁻⁷. For instance, uncontrolled fertility has been reported to have adversely influenced the socio-economic, demographic and environmental development of countries such as Ethiopia and other less developed countries^{1,4,5}. Apart from that, studies conducted in Nigeria and other African countries and some other less developed countries have shown that unemployment rate is closely related to high rate of fertility^{4,7-11} and its long run consequence- population explosion. Hence, any study focusing on providing policy makers with information on the indicators of population explosion is a crucial implement for intervention and control.

Although it is known that the level of fertility of any population is influenced by both indirect (socio-economic and cultural systems) and direct (proximate or intermediate) determinants or factors^{3,10-12}, fertility rate in Nigeria is known to be unequal across geopolitical zones due to differences in culture, religious inclinations and some other contextual and individual based characteristics^{3,4}. In particular, the North East and North West have consistently shown higher fertility rates over other regions since 1990 with the North Central following closely while the South west trails¹³.

With the global concern on the world population explosion, it has become imperative to study objectively (and critically) not only trend but also possible factors that could inflate fertility rate in any country in order to provide clues on how to identify and alleviate such phenomenon. It is worthy to note that, a number of studies have been published both within and outside Nigeria that bears on fertility rate and attendant consequences^{2,4,5,14-21}.

In the present study, we used a generalized linear model (Poisson regression model) and a (natural) log link function to explore to what extent do fertility determinants affects the level of fertility among women of childbearing age in Nigeria. The intentions were to identify which determinants were more pertinent to the level of fertility in the country. We also intend to speak on the rate ratio associated with selected predictors in our model. Since human fertility is a function of a variety of factors varying from place to place depending on conditions specific to the area⁵, a proper understanding of the dynamics of these factors is crucial to policy makers at all level.

2. Methods

2.1 Study design, sample size and data collection

Although details of the study design and all other methods connected with the data collection and sampling strategies in the 2008 NDHS have been published in different reports^{3,22}, we briefly highlight some important aspects. With the 2006 Population and Housing Census of the Federal Republic of Nigeria as the sampling frame, the sample for the 2008 NDHS was designed to provide population and health indicators at the national, zonal, and state levels³. The primary sampling unit (PSU), referred to as a cluster for the 2008 NDHS, is defined on the basis of the Enumeration Areas (EAs) from the 2006 EA census frame. The 2008 NDHS sample was selected using a stratified two-stage cluster design consisting of 888 clusters, 286 in the urban and 602 in the rural areas³. A complete listing of households and a mapping exercise were carried out for each cluster with the resulting lists of households serving as the sampling frame for the selection of households in the second stage. In the second stage of selection, an average of 41 households was selected in each cluster, by equal probability systematic sampling. All women age 15-49 who were either permanent residents of the households in the 2008 NDHS sample or visitors present in the households on the night before the survey were eligible to be interviewed. Specialize questionnaires were used to interview a total of 33, 385 women in the 2008 NDHS³.

2.2 Ethical consideration

The 2008 NDHS was reviewed and granted approval by the National Health Research Ethics Committee with assigned number NHREC/01/01/2007, for the study period of February 22, 2008 to February 23, 2009³. In addition, a part from the informed consent given by the participants before participation and the fact that all information was collected confidentially; effort was made in the present analysis to conceal the identity of the participants by removing all identifier information prior to analysis.

2.3 Variables

The main outcome variable in this analysis is the level of fertility defined by the total number of children ever born by women before attaining the age of 50 years. Total number of children born by women before attaining the age of 50 years have been used to inform fertility in past studies^{5,9}.

The predictor variables were divided into two categories: the proximate determinant of fertility: current marital status; polygyny (having more than one wife at the same time); age at first marriage; age at first sexual intercourse; recent sexual activity; postpartum amenorrhea, abstinence and insusceptibility; age at first birth as well as use of contraceptives) and selected sociodemographic variables found to significantly impact the level of fertility elsewhere^{5,9,15,18} and whose predictive capability we desire to examine on the level of fertility in Nigeria.

These variables included place of residence (Rural and Urban); individual wealth index (Poor, Average, Rich); household wealth index (Poor, Average, Rich) - measured as the median wealth index of all members of the household to which a respondent belongs; highest educational status and whether husband lives in the house with the woman.

2.4 Data Management and Editing

A total of 33, 385 women age 15-49years participated in the 2008 NDHS and a total of 10 variables were listed as proximate determinants of fertility³. Unfortunately, many of the variables consisted of missing observations, inconsistent observations etc. Consequently, variable like postpartum amenorrhea, abstinence and insusceptibility and recent sexual activities were deleted from the modelling processes because of the large missing observations recorded. In addition, cases or respondents with missing observation(s) in either the outcome variable or any of the predictors of interest were deleted from the extracted data used for analysis. This brought the total sample size finally used for the analysis (modeling) to 20, 974 which is 62.8% of the total women interviewed in the 2008 NDHS.

Furthermore, some variables were recoded from their original codes as contained in the NDHS data to a form that is relevant to the objectives of the present study. Specifically, the following variables were re-coded accordingly: religion (Christianity, Islam and Others), ethnicity (Hausa, Igbo, Yoruba and Others), household wealth index (Poor, Average, Rich), husband lives in the house (Yes, No); age at first birth, contraceptive use (<15, 15-30, 31-49), number of other wives (None, ≥ 1), age at first marriage (<15, 15-30, 31-49), age at first intercourse (<15, 15-30, 31-49). Details about previous nature of these variables are available in the 2008 NDHS reports³.

2.5 Statistical Modeling and Data Analysis

Given the count nature of the outcome variable, a generalized linear model (GLM) with a natural logarithmic link function - Poisson regression⁹ was adopted to assess how the predictor variables influence the level of fertility (defined by the number of children ever born by women of childbearing age- 15-49years) in Nigeria.

Specifically, let Y_i denote the number of children ever born by a woman i of childbearing age and t_i denote the observation time for the i th woman. Let λ_i denote the mean rate of children per unit time so that the mean number of children for the i th woman is given by $\lambda_i t_i$ ²³. We assumed that Y_i has a Poisson distribution with log of the mean given by

$$\begin{aligned} \ln E[Y_i] &= \ln[\lambda_i t_i] \\ &= \ln \lambda_i + \ln t_i \\ &= \beta_0 + \sum_{j=1}^p \beta_j X_{ji} + \ln t_i \end{aligned} \quad 1$$

Where X_{ji} is the j th characteristic (predictor variable) of the i th woman, β_0 is an intercept term, β_j represent measures of effects of the predictor variables and $\ln t_i$ is an offset variable. In this study, current age of women was the time at which observation for the number of children ever born was made on the i th woman. Since this differs across women, the offset variable was set to $\ln(\text{Current Age})$. Equation (1) shows that the main part of the model (consisting of all the terms except for the offset term) is modelling the rate of children born by women of childbearing age per unit time:

$$\ln[\lambda_i] = \beta_0 + \sum_{j=1}^p \beta_j X_{ji} + \ln t_i \quad 2$$

or, equivalently, exponentiations of both sides give

$$\lambda_i = \exp[\beta_0 + \sum_{j=1}^p \beta_j X_{ji} + \ln t_i] \quad 3$$

The modeling processes involved four modeling stages: first, the predictive ability of each variable was assessed using simple Poisson regression models.

The second (Model 2) involved a multiple Poisson regression model consisting of only the selected sociodemographic variables found to possess individual predictive capability in order to reaffirm their contributions when other socio-demographic characteristics are adjusted for. In the third stage (Model 3), only the proximate determinants of fertility were used in the modeling exercise. This was to assess the effect of each proximate determinant (on fertility) in the presence of others. The final step (Model 4) consisted of a multiple Poisson regression modeling using the selected socio-demographic characteristics (found to be significant in the third model) and the proximate determinants of fertility. In the modeling processes, we referenced the category assumed to have low level of fertility in order to study the likelihood of having high level of fertility in the population. Incidence Rate Ratio (IRR) with 95% Confidence Interval (CI) was used to assess the association of the selected demographic variables and the proximate determinants with fertility⁹.

The models were investigated using the HYBRID (encompassing both Fisher and Newton-Raphson methods) procedure of the SPSS GENLIN with a robust covariance (standard error) estimator in the IBM SPSS software (version 20). Estimates of the Corrected Akaike's Information Criterion (CAIC) and the Bayesian Information Criterion (BIC) provided with the output of the analysis from the IBM SPSS were used for the goodness of fit test. A lower value on AIC or BIC indicates a better fit of the model (IBM-SPSS, 2010).

3. Results

3.1 Proximate determinant of fertility and selected sociodemographic characteristics

Data related to a total of 20,974 women of childbearing age were extracted from the 33,385 total sample studied in the 2008 NDHS. The distribution of the extracted data according to the determinants of fertility and the geopolitical zones in Nigeria is presented in Table 1. Majority of the respondents (more than 80%) in each zones were within 15 to 30 years of age when they had their first birth while less than 10% of them were 31 years and above when they had their first birth. Specifically, while 3,472(88.5%), 3,837(85.2%) and 2,747(93.5%) of the respondents who were within 15 to 30 years of age (when they had their first birth) were from the North central, North east and the South south. On the overall, 2,156(10.3%) of the respondents were less than fifteen years of age when they had their first birth.

In addition, while most of the women (98.4%) were married, only 13.4% of the respondents currently use contraceptives and 13.3% of them had their first sexual intercourse before the age of 15. Also, although some of the women got married as teenagers, most of them (65.0%) were the only wife of their husband and more than 90% of them had their husband living with them (Table 1). Moreover, while, more than 48% of the women were poor, more than 50% them had no formal education, over 60% of them were from an average household (economically) and only 1.6% were from rich homes (Table 1).

3.2 GLM analysis

The results of the generalized linear models are presented in Table 2. The predictive capability of the individual proximate determinants of fertility and the selected sociodemographic variables were as presented using the Wald Chi-square statistics in column two of Table 2 while the results of the other models (Model 2, Model 3 and Models 4) were presented as Incidence Rate Ratios (IRR) columns 3 to 5.

The Wald Chi-square statistics for testing the predictive capability of each variable were 2,181.48; 1,966.28 and 200.57 for age at first birth, age at first marriage and whether husband lives with the woman respectively with p-values<0.001 for all the variables (Table 2). In fact, Table 2 shows that all the variables were (individually) significant predictors of fertility in Nigeria.

Meanwhile, in Model 2, fertility was 1.02 times higher among women living in the rural areas compared to those living in the urban areas. Women who had secondary education, primary education or no formal education respectively had 1.19, 1.47 and 1.48 times more children compared to those who had completed a tertiary education. Also, while fertility was 1.02 times higher among the Hausa speaking women compared to the rest minority tribes, the Yoruba women had 18% lower fertility compared to the minority tribes. Poor women had 1.04 times more children than the rich women while women from poor households had 6% higher fertility compared to those from rich households.

Furthermore, in model 3 (Table 2), women who had their first birth between the age of 15-30 years and those who had their first birth after the age of 30 years had (respectively) 18% and 61% lower fertility compared to those who had their first child when they were less than 15 years of age. Similarly, women who had their first sexual intercourse between the age of 15-30 years had 11% lower fertility compared to those who had the experience when they were less than 15 years old while those who had their first experience of sexual intercourse after attaining the age of 30 years had 1.09 times higher fertility compared to those who had the experience at an age less than 15 years.

The results of model 4 (Table 2) showed that, although women whose husband lives with them had 1.07 times more children than those whose husbands do not live in the house, contrary to expectations, women who do not use any contraceptive method had 9% lower fertility compared to those who use. Also, judging by the estimates of both the AICC and the BIC, model 4 is better than either model 2 or model 3.

In figures 1 and 2, the distribution of women with respect to children ever born and the Geographical distribution of number of children ever born were presented. In particular, in figure 1, more than fifty percent of the women gave birth to four or less children while in figure 2, fertility is relatively higher among rural women except in the South south geopolitical zone where the numbers of children ever born were 6.2% higher among urban women compared to rural women.

4. Discussion

This paper examined the association between the proximate determinant of fertility as well as selected socio demographic characteristics of mothers and their level of fertility. We intended to assess the contribution of selected socio demographic characteristics of mothers to the level of fertility when the proximate determinants of fertility were controlled for and vice versa. It was found that a part from religion, all the selected socio demographic characteristics considered in this study do not only possess individual predictive capability, but also strongly associated with the level of fertility even when the proximate determinants of fertility were adjusted for. It was also found that women in the rural areas were more likely to give birth to more children than those in the urban areas. This is consistent with past studies conducted in Nigeria and other part of the world^{2,9,24}. In Nigeria, this evidence is being fueled by the demand for children in the rural areas to help in farming labour², low level of education of rural dwellers and in some cases, sex preference in childbearing.

In addition, level of education was found to be significantly associated with fertility level. Women with low level of education were found to be more likely to have more children than women who had tertiary education. When only the sociodemographic characteristics were considered, women with no formal education and those with only primary school education show almost fifty percent increase in the level of fertility compared with women who had tertiary education. When the proximate determinants of fertility were adjusted for, these levels of education show almost two-third increase in the level of fertility over tertiary education. Studies conducted in Nigeria^{2,25} and Ethiopia⁹ showed that women who had many years of education had significantly lower fertility as compared to those who had never been enrolled into any formal education system. Also, Alene and Worku⁵ reported that women who had at least a high school education showed nearly a two-third reduction in fertility compared to women with no education.

Furthermore, it was also found that the level of fertility in Nigeria cannot be dissociated from ethnic background of the women. In this study, while the Hausa and the Igbo women were found to be more likely to have higher fertility than those from the minority groups, there was over eighty percent decrease in the level of fertility among the Yoruba women when compared with the minority groups. This was consistent with the 2008 NDHS reported³ where lowest fertility rate was reported for the South west zone which is predominantly inhabited by the Yorubas. Although a particular attention was not given to it in this study, the level of fertility among the Yorubas may be attributed to the high level of education among them. In fact, the distribution of women under study showed that the Yorubas had the lowest number of uneducated women.

Both personal and household wealth index were also found to influence level of fertility. Specifically, it was found that poorer women were more likely than their rich counterparts to be at risk of high fertility. On the contrary, in a study conducted among rural Yoruba women, it was found that level of fertility was positively associated with high income level.

However, in most communities in Nigeria, wealth is practically associated with level of education which in addition to study has been found to negatively impacts on the level of fertility^{2,5,9,25}. It was also found that women whose husbands live (dwell) with them in the same house were found to be at risk of high fertility than those whose husbands live elsewhere. Although couples who are legally married could live apart (especially in cases of polygamy) in Nigeria, couples living together should have higher coital frequency and hence the likelihood for higher fertility for the woman.

On the other hand, this study confirmed that the 2008 NDHS listed proximate determinants of fertility were strongly association with fertility level when studied individually, when studied together and with the selected socio demographic characteristics adjusted for. In particular, while women who started giving birth and those who had their first marriage after 14years of age were less likely to have high fertility than those who started giving birth earlier, those who had their first sexual intercourse at after the age of 30 years old were more likely to have high fertility than those who had the experience before they were 15years old. Higher fertility level had been reported for women who married in their teens⁹ and an increase in the average age at marriage had been reported to have adverse effect on high fertility⁵. Direct effects of women marrying in their teens include too many teen pregnancies which could have negative effect on the health of women and a longer fertility span for women resulting in raised average number of children born by women. Although the culture in certain part of the country abhors teenage marriages, unfortunately however, there has been no statutory age at marriage in Nigeria.

Furthermore, while women who were legally married were more likely than those only living together with a sexual partners (without a legal marriage), to have higher fertility, women who were the only wife of their husbands showed close to ten percent decrease in fertility compared to women in a polygamy. Past studies have shown that married women have tendencies for high fertility compared to unmarried women. In a cross sectional studies conducted in Ethiopia, Alene and Worku⁵ reported that married women were 1.62 times more likely to be at risk of high fertility compared to those who were not in union. Also, past study in Nigeria had shown that women in polygamous marriages have higher fertility rate than those in monogamous unions⁴. While most monogamous couples have well planned families, the tendencies for co-wives (in polygamous marriages) to consciously or unconsciously engage in competition over number of child birth had been reported⁴.

It was also found that when the socio demographic characteristics were unadjusted for, women who do not use any contraceptive were more likely to have increased fertility, while they were less likely to experience higher fertility when the socio demographic characteristics were adjusted for. This was also consistent with a study elsewhere where lack of contraceptives use by women was found to be marginally associated with high fertility level in a past study⁵

5. Conclusions

Using a generalized linear modeling approach we reported the effects of possible determinants of fertility in Nigeria. Although due to missing observations, two proximate factors and information for over ten thousand women were not included in this analysis, the extracted data from the original data was sufficient for this study. Clearly, societal factors have great influence on the level of fertility in Nigeria. Fertility level in Nigeria was found to be higher in the rural areas than in the urban areas, among the less educated and poorer women. We recommend that future DHS in Nigeria should in addition to the proximate determinants of fertility, give special attention to selected sociodemographic factors such as highest level of education of women, Ethnicity, Wealth indexes and Husband living with the wife as potential factors influencing fertility level in Nigeria. This will further equip policy makers on what class of women or ethnic group to focus aggressive interventions.

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Appendix

Table 1: The Distribution of Respondents across geopolitical zones and determinants of fertility

Variable	North central	North east	North west	South east	South west	South south	Combined
Age of respondent at 1st birth							
<15	388(9.9)	629(14.0)	750(13.5)	99(5.8)	190(8.0)	100(3.4)	2156(10.3)
15-30	3472(88.5)	3837(85.2)	4759(85.9)	1512(89.3)	2144(90.2)	2747(93.5)	18471(88.1)
31-49	62(1.6)	38(0.8)	30(0.5)	83(4.9)	43(1.8)	91(3.1)	347(1.7)
Total	3922	4504	5539	1694	2377	2938	20974
Current contraceptive method							
No	3326(84.8)	4312(95.7)	5383(97.2)	1330(78.5)	1773(74.6)	2032(69.2)	18156(86.6)
Yes	596(15.2)	192(4.3)	156(2.8)	364(21.5)	604(25.4)	906(30.8)	2818(13.4)
Total	3922	4504	5539	1694	2377	2938	20974
Current marital status							
Married	3899(99.4)	4489(99.7)	5532(99.9)	1671(98.6)	2157(90.7)	2887(v)	20635(98.4)
Living together	23(0.6)	15(0.3)	7(0.1)	23(1.4)	220(9.3)	51(1.7)	339(1.6)
Total	3922	4504	5539	1694	2377	2938	20974
Number of other wives							
None	2475(63.1)	2545(56.5)	3227(58.3)	1394(82.3)	1885(79.3)	2100(71.5)	13626(65.0)
≥ 1	1447(36.9)	1959(43.5)	2312(41.7)	300(17.7)	492(20.7)	838(28.5)	7348(35.0)
Total	3922	4504	5539	1694	2377	2938	20974
Age at first marriage							
<15	774(19.7)	1872(41.6)	2585(46.7)	174(10.3)	336(14.1)	213(7.2)	5954(28.4)
15-30	3101(79.1)	2618(58.1)	2941(53.1)	1458(86.1)	1993(83.8)	2676(91.1)	14787(70.5)
31-49	47(1.2)	14(0.3)	13(0.2)	62(3.7)	48(2.0)	49(1.7)	233(1.1)
Total	3922	4504	5539	1694	2377	2938	20974
Age at first intercourse							
<15	290(7.4)	919(20.4)	1024(18.5)	66(3.9)	330(13.9)	165(5.6)	2794(13.3)
15-30	2790(71.1)	2751(61.1)	3429(61.9)	1208(71.3)	1811(76.2)	2481(84.4)	14470(69.0)
31-49	842(21.5)	834(18.5)	1086(19.6)	420(24.8)	236(9.9)	292(9.9)	3710(17.7)
Total	3922	4504	5539	1694	2377	2938	20974
Type of place of residence							
Urban	1058(27.0)	982(21.8)	875(15.8)	677(40.0)	638(26.8)	1561(53.1)	5791(27.6)
Rural	2864(73.0)	3522(78.2)	4664(84.2)	1017(60.0)	1739(73.2)	1377(46.9)	15183(72.4)
Total	3922	4504	5539	1694	2377	2938	20974
Highest educational level							
No education	1764(45.0)	3354(74.5)	4538(81.9)	226(13.3)	243(10.2)	516(17.6)	10641(50.7)
Primary	1083(27.6)	694(15.4)	590(10.7)	585(34.5)	868(36.5)	821(27.9)	4641(22.1)
Secondary	798(20.3)	391(8.7)	323(5.8)	692(40.9)	1047(44.0)	1206(41.0)	4457(21.3)
Higher	277(7.1)	65(1.4)	88(1.6)	191(11.3)	219(9.2)	395(13.4)	1235(5.9)
Total	3922	4504	5539	1694	2377	2938	20974
Religion							
Christianity	2150(54.8)	865(19.2)	294(5.3)	1578(93.2)	2236(94.1)	1843(62.7)	8966(42.7)
Islam	1687(43.0)	3576(79.4)	5147(92.9)	4(0.2)	88(3.7)	1064(36.2)	11566(55.1)
Others	85(2.2)	63(1.4)	98(1.8)	112(6.6)	53(2.2)	31(1.1)	442(2.1)
Total	3922	4504	5539	1694	2377	2938	20974
Ethnicity							
Hausa	449(11.4)	1924(42.7)	4956(89.5)	9(0.5)	6(0.3)	87(3.0)	7431(35.4)
Igbo	117(3.0)	9(0.2)	11(0.2)	1647(97.2)	187(7.9)	179(6.1)	2150(10.3)
Yoruba	452(11.5)	12(0.3)	18(0.3)	2(0.1)	37(1.6)	2317(78.9)	2838(13.5)
Others	2904(74.0)	2559(56.8)	554(10.0)	36(2.1)	2147(90.3)	355(12.1)	8555(40.8)
Total	3922	4504	5539	1694	2377	2938	20974
Wealth index							
Poor	1683(42.9)	3278(72.8)	3832(69.2)	366(21.6)	512(21.5)	526(17.9)	10197(48.6)
Average	983(25.1)	714(15.9)	884(16.0)	419(24.7)	580(24.4)	437(14.9)	4017(19.2)
Rich	1256(32.0)	512(11.4)	823(14.9)	909(53.7)	1285(54.1)	1975(67.2)	6760(32.2)
Total	3922	4504	5539	1694	2377	2938	20974
Household Wealth Index							
Poor	1484(37.8)	174(38.7)	2102(37.9)	570(33.6)	891(37.5)	1114(37.9)	7902(37.7)
Average	2388(60.9)	2706(60.1)	3338(60.3)	1086(64.1)	1444(60.7)	1768(60.2)	12730(60.7)
Rich	50(1.3)	57(1.3)	99(1.8)	38(2.2)	42(1.8)	56(1.9)	342(1.6)
Total	3922	4504	5539	1694	2377	2938	20974
Husband lives in house							
No	410(10.5)	217(4.8)	302(5.5)	267(15.8)	443(18.6)	417(14.2)	2056(9.8)
Yes	3512(89.5)	4287(95.2)	5237(94.5)	1427(84.2)	1934(81.4)	2521(85.8)	18918(90.2)
Total	3922	4504	5539	1694	2377	2938	20974

Table 2: Association of variables with the level of fertility

Variables	Model for the individual Variable	Model for selected sociodemographic factors	Model for the NDHS Proximate Determinants of fertility	Full Model
	Wald Chi-square	Adjusted IRR (95% CI)	Adjusted IRR (95% CI)	Adjusted IRR (95% CI)
Age of respondent at 1st birth	2181.48***			
<15			-	-
15-30			0.82(0.81-0.84)***	0.83(0.81-0.84)***
31-49			0.39(0.37-0.42)***	0.42(0.39-0.45)***
Current contraceptive method	136.02***			
No			1.02(1.01-1.04)**	0.91(0.90-9.3)***
Yes			-	-
Current marital status	80.31***			
Married			1.24(1.17-1.32)***	1.18(1.12-1.26)***
Living together			-	-
Number of other wives	468.24***			
None			0.91(0.91-0.92)***	0.95(0.94-0.96)***
≥ 1			-	-
Age at first marriage	1966.28***			
<15			-	-
15-30			0.85(0.84-0.86)***	0.91(0.89-0.92)***
31-49			0.82(0.76-0.87)***	0.90(0.85-0.97)**
Age at first intercourse	1611.937***			
<15			-	-
15-30			0.89(0.87-0.90)***	0.91(0.89-0.92)***
31-49			1.09(1.07-1.11)***	1.08(1.06-1.11)***
Type of place of residence	447.79***			
Urban			-	-
Rural		1.02(1.00-1.04)*		1.02(1.00-1.03)
Highest educational level	2516.839***			
No education		1.48(1.43-1.53)***		1.36(1.32-1.41)***
Primary		1.47(1.42-1.52)***		1.38(1.34-1.42)***
Secondary		1.19(1.15-1.22)***		1.17(1.13-1.2)***
Higher		-		-
Religion	809.67***			
Christianity		0.98(0.94-1.02)		1.00(0.96-1.05)
Islam		1.03(0.98-1.07)		1.03(0.98-1.07)
Others		-		-
Ethnicity	1798.45***			
Hausa		1.02(1.01-1.04)*		1.01(0.10-1.03)
Igbo		1.00(0.98-1.02)		1.01(0.99-1.03)
Yoruba		0.82(0.81-0.84)***		0.85(0.84-0.87)***
Others		-		-
Personal wealth index	1180.76***			
Poor		1.04(1.02-1.06)***		1.05(1.03-1.07)***
Average		1.04(1.02-1.06)***		1.04(1.03-1.06)***
Rich		-		-
Household wealth index	27.92***			
Poor		1.06(1.01-1.11)*		1.06(1.01-1.11)*
Average		1.06(1.01-1.11)*		1.06(1.01-1.12)*
Rich		-		-
Husband lives in house	200.570***			
No		-		-
Yes		1.09(1.06-1.11)***		1.07(1.05-1.10)***
AICC		85064.68	84198.94	82927.79
BIC		85183.92	84278.43	83118.56

IRR- Incidence Rate Ratio; CI- Confidence Interval; *P<0.05, **P<0.01, ***P<0.001

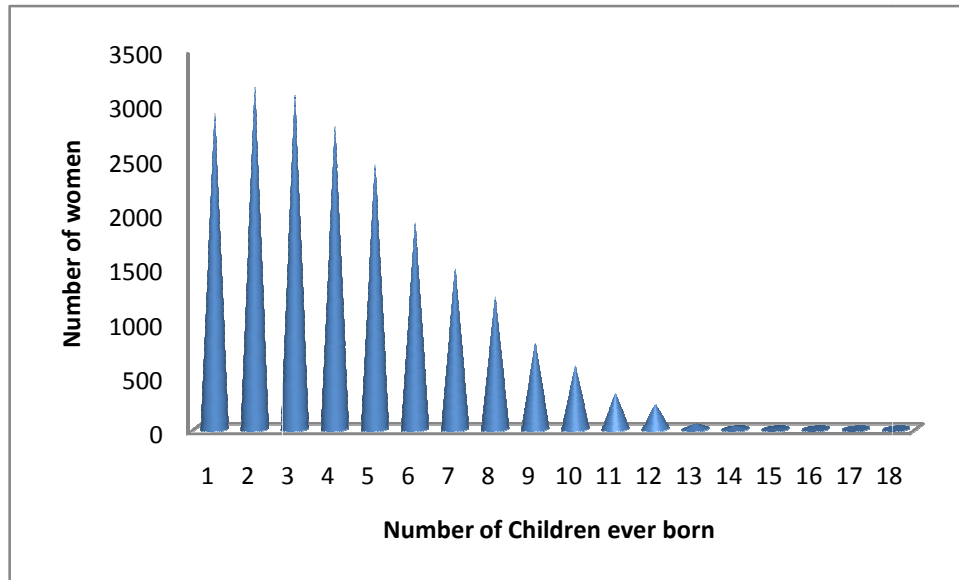


Figure 1: The distribution of women with respect to children ever born

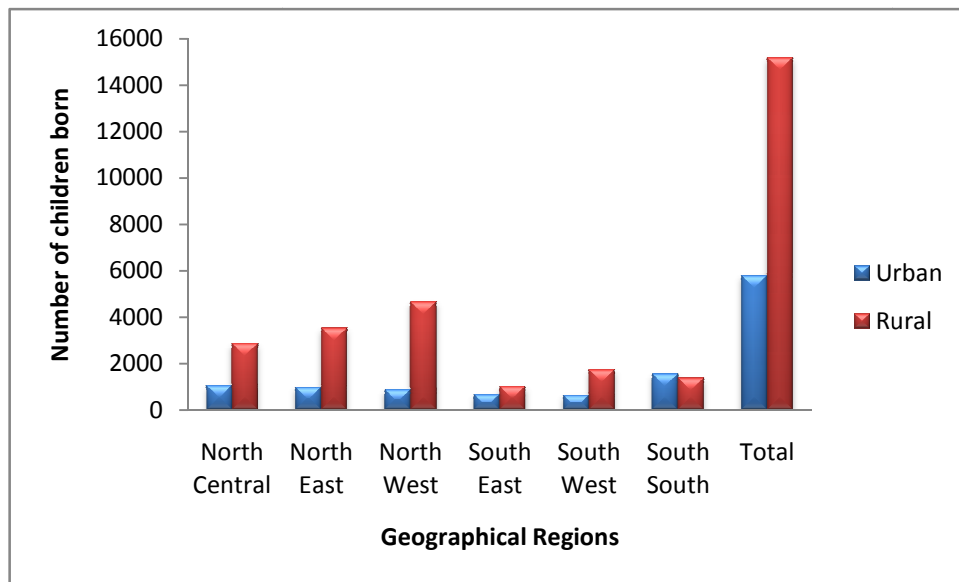


Figure2: Geographical distribution of number of children ever born to women <50 years old