Level and determinants of high fertility in two contrasting populations in Nigeria

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Abstract

This study examined levels and determinants of high fertility in the north-west and south-west zones in Nigeria. The study utilized 2013 nation-wide survey data on women aged 15-49 years (n=11,300). Data were analysed using ANOVA, logistic-regression, Brass P/F-ratio, Brass-relational Gompertz fertility and survival analysis models. About 44.4% of women in the north-west had high fertility (CEB≥5) compared to 26.9% in the south-west. The refined TFR, childbearing transition probabilities and progression rate were higher in the north-west (prr=0.2686) than south-west (prr=0.1709). The extent at which the age location of childbearing in the north-west (α=-0.003, StdE=0.083) differs from the standard was higher than south-west (α=-0.032, SE=0.95), but the fertility distribution across ages in the south-west was narrower. The odds of high fertility was higher in the north-west (OR= 2.18, C.I=1.99-2.37, p<0.001) than south-west. This odds barely changed when other factors such as age, age at first-sex, age at first-birth, modern contraceptive use, wealth quintile, education, religion, ethnicity, sex preference and ideal family size were controlled for. Fertility level was higher in the north-west than south-west. Improving women's education in the north-west may facilitate low fertility in the region.

Keywords: Fertility levels, Transition probability, Nigeria

Introduction

Fertility is one of the key components of population dynamics and its rates and level are used as part of indices for development assessment in any nation. Persistent worry in some societies today is that the reproduction rate is not the same in different population groups as this at times gives a wrong impression of the overall fertility rate when it is aggregated for the society. Fertility differentials among population groups frighten those who think that changes in comparative numbers threaten changes in dominance patterns for political reasons and economic gains (World Bank, 2008). Somewhat, high fertility is still sustained in Nigeria despite fertility reduction campaigns and availability of free family planning services provided by government and other non-governmental family planning service providers (Nigeria Health Watch Admin, 2015; Federal Ministry of Health [Nigeria], 2004; National Population Commission [Nigeria], 2004). However, fertility differential exists across the regions in the country with south-west consistently having the least while north-west tops the list in the total fertility rate (TFR) figures. Based on the available data and evidence, one can infer that fertility transition has begun in the south-west, but it is yet to begin in the north-west Nigeria. The TFR in north-west and south-west was 6.64 and 5.6 in 1990 and 6.7 and 4.6 in 2013 respectively (National Population Commission and ICF International, 2013). The striking differential in TFR in these two regions in the same country raises a question on why the gap despite the fact that the regions receive their main financial capital and health services disbursement from the central government. The ever observed differences in fertility in the south-west and north-west Nigeria are yet to be explained in terms of either demographic or socio-economic values as shown in this study. In addition, we identified the determinants of high fertility in these two geo-political zones in Nigeria. With this one can identify and compare the factors responsible for the differential in fertility in the zones.

Most research on fertility in Nigeria during the past three decades focused on the socio-economic factors to illuminate underlining mechanisms of fertility

(Fagbamigbe and Adebowale, 2014; Akpa and Osayomore, 2012; Akinrinola, 1995). Although these studies show superficially how socio-economic factors such as education, marital status, wealth status, women socio-economic status, religion, place of residence relate to fertility, they do not reveal their associations with high fertility as placed in the context of this paper. The present paper builds on the analysis of several studies on fertility determinants in Nigeria by examining socio-demographic factors responsible for inequalities in fertility in north-west and south-west Nigeria. More importantly, the correctness of the convectional fertility measurement technique for regions in Nigeria may generate wrong estimates of the levels of fertility due to poor data quality on reported births and birth dates which is peculiar to data collected in developing countries (Makinde et al., 2016; Williams, 2014). The vital registration system is either non-existence or inadequate in Nigeria (Makinde et al., 2016; Adedini and Odimegwu, 2011). Unfortunately, these arguments have not served as a challenge to fertility estimation; rather, most researchers have simply lived with this limitation in the fertility estimates. Consequently, the use of indirect methodology which tends to provide adjustment mechanism that accounts for poor fertility data quality becomes inevitable. In order to ascertain the exactness of the gap in the level of fertility in the north-west and south-west for instance, advanced demographic methods were used in this study. The study provided an estimate of the refined TFR using Brass P/F ratio and Brass-relational Gompertz model. Childbearing transition probabilities and progression rate were also examined to establish how women aged 45-49 years progressed in childbearing in the two regions.

In 1988, Nigeria population policy was formulated and reviewed in 2004. In the policy document, it was recommended that couples halt childbearing after having four children at most (National Population Commission, 2003). Regrettably, many women in Nigeria today bear more than four children due to some barriers to the policy implementation which included; human rights policy, cultural instincts, religion, and high level of illiteracy. In this study, the predictors of high fertility (bearing at least five children) were identified in the north-west and south-west Nigeria. Sustenance of high fertility might be one of the reasons for failure to meet the target on the themes 1, 4 and 5 of the Millennium Development Goals; to eradicate extreme poverty and hunger, reducing child mortality rates, and improving maternal health at the deadline in Nigeria. Nigeria is still a poverty stricken nation where majority live on less than two dollars per day, the childhood mortality (IMR is 69/1000, U5MR is 128/1000) is high and the burden of maternal mortality (MMR=576/100,000) is among the highest word-wide (National Population Commission and ICF International, 2014, PRB, 2015).

Unlike the prior studies that have examined the fertility differentials in Nigeria (National Population Commission and ICF International, 2014; National Population Commission and ICF International, 2009; Osuafor, 2011; Oduet al., 2005; Akinrinola, 1995), the present study examined both the level and timing of fertility in the north-west and south-west regions. The emphasis in the analysis is on the use of the observed historical sequence of births reported by woman, rather than only the aggregate number. The study outcome is intended to assist policymakers in evaluating and designing programmes for fertility reduction in north-west and other regions with similar fertility structure to north-west in Nigeria. The methods used in this study are scarcely used for fertility analysis in Nigeria. Thus the approach will be handy for fertility comparison in different population groups particularly developing countries in Africa sub-regions.

Literature Review:

Several years ago, Hawthorn developed a framework for "explaining human fertility" that included economic, cultural and technological factors (Hawthorn, 1970). He opined that the manner and pace at which people bear children cannot be easily understood from one perspective. Thus the term multi-phasic demographic response was used, indicating a variety of demographic, socio-cultural, technological, and economic approaches to explaining fertility (Becker, 1982). Becker (1982) in his contribution to explanation on factors influencing fertility emphasized that family size is determined by; a couple's income and the cost they incur in having and taking care of children. However, Easterlin argues that in the context of low economic development and weak institutional stability, specifically when children generate a positive net flow of income to the parents, household will desire high fertility to avoid risk (Easterlin, 1978). Coale and Hoover, 1958 believed that cultural factors including shared ideas, values, beliefs, customs, and material artefacts are the main determinants of fertility. Fertility tends to be higher in societies where women suffer from social, economic and political neglect; and less autonomy in decision making at the household level. The social structural theories show that under the socio-economic conditions of an industrial society, large families become a burden, especially for parents who seek upward social mobility. The wealth flow theory emphasized that fertility decisions in all societies are economically rational responses to

family wealth flows. Therefore, in societies with net upward wealth flows, high fertility is often desired (Caldwell, 1982).

One of the foremost demographic issues facing the world today is population growth, inequalities in fertility and its consequences on socio-economic development and advancement. In the past few decades, the world has experienced fall in fertility rates apparently because of decline in childhood mortality level which reduces the desire for large families as insurance and improvement in uptake of modern fertility control measures (PRB, 2014; Bongaarts and Watkins, 1996; Bulatao and Lee, 1983). Studies have reported that fertility transition is in progress in some sub-Sahara African countries (Bongaarts, 2008; Guttmacher, 2008). The improving socio-economic status of women and increasing demand for human capital to combat the economic harsh conditions particularly in developing countries and cost implication of childbearing are other important reasons for the choice of small family size in the region. Unfortunately, factors such as early marriage, early child bearing, low contraceptive use and high social values placed on child bearing have sustained high fertility in Nigeria (National Population Commission and ICF International, 2013; Feyisetan and Bankole, 2002).

Nigeria is among the top-ten most populous countries world-wide and ranks as one of the high fertility countries (Norville et al., 2003; PRB, 2015). Numerous factors have contributed to consistent reporting of high levels of fertility in Nigeria but disparities exists within its regions. Previous studies have shown that women in polygamous homes are more likely to experience higher fertility than those in monogamous unions (Alonge, 2014; Ushie et al., 2014; Odu et. al., 2005). This has been ascribed to competition for family resources as observed in some cultures in Nigeria, the wife with the highest number of children has the largest part of the property or inheritance. Although, other cultures do base the sharing on the number of males per woman. This notion often influences the decision of some women on childbearing particularly when they are yet to have number of male children that can match that of co-wives in the family. Findings also revealed that women who belong to Islamic religious group bear more children than their counterparts who are Christians (Fagbamigbe and Adebowale, 2014; Akpa and Osayomore, 2012; Li Zhang, 2008). Moreover, education has been identified as one of the key determinants of fertility. The finding that is consistent and common in literature is that the higher the level of education, the lower the measure of fertility (Fagbamigbe and Adebowale, 2014; Akpa and Osayomore, 2012; Odimegwu, 1998). Therefore, there is tendency that fertility rates would be higher in a society where the level of illiteracy is high. Education has influence on virtually all socio-economic and demographic phenomena including fertility control measures such as the uptake of modern contraceptives. It facilitates postponement in age at first sexual debut, marriage and childbearing thus reduces the childbearing interval. Aside the cultural instincts, the institution of polygamy, Islamic religion and illiteracy which are more prominent among families in the north-west than their counterparts in the south-west can contribute to high fertility in the region (National Population Commission and ICF International, 2013; NPC, 2006).

Differentials in the level of childhood mortality had been identified as part of the reasons for variation in fertility levels between communities. The belief is that when mortality increases, the number of births needed to accomplish a specified number of surviving children would rise. Such a relationship has been extensively studied in demographic research. Literature are consistent with the view that higher level of mortality facilitates higher level of fertility (Nobles et. al., 2014; Kapoor et al., 2003). For example, Noble and colleagues examined the fertility response to an unforeseen mortality resulted from the tsunami disaster and found a sustained fertility increase driven by two behavioural responses to mortality experience. First, the likelihood of bearing additional child was significantly higher among mothers who lost at least one child in the disaster than those who did not lose any child. This action explains about 13 percent of the aggregate increase in fertility (Nobles et. al., 2014). Second, women who had not begun childbearing before the disaster initiated family-building earlier in populations where tsunami-related mortality rates were higher, an indication that fertility is an important route to rebuilding the population after tsunami incident (Nobles et. al., 2014). The “demographic transition theory" has indeed established causal links between fertility and mortality during the final state of transition where reduction in mortality translates to decrease in fertility (Warren, 2003). Consistent reporting of higher childhood mortality in the north-west than south-west Nigeria was found in the five rounds of national surveys previously held in Nigeria (National Population Commission and ICF International, 1990; 1999; 2003; 2008; 2013). In this context, one can ascribe higher fertility level constantly experienced in the north-west than south-west Nigeria to higher childhood mortality in the region.

An important model in fertility discourse was proposed by Bongaarts where he collapsed the set of

intermediate fertility variables suggested by Davis and Blake (1956) into three key groups. These are; exposure factors, deliberate marital fertility control factors and, natural marital fertility factors. The proportion married in a population was classified as exposure factor while contraception and induced abortion were put under the deliberate marital fertility control factors (Bongaarts, 1978). The natural marital fertility factors are lactational infecundability, frequency of intercourse, sterility, spontaneous intrauterine mortality and duration of the fertile period. His argument was that substantial insights can be gained into determinant of fertility level and its dynamics if the underlying mechanisms through which socioeconomic factors influence fertility are identified. Bongaarts, 1978 pointed out that disparity in fertility can always be linked to variations in at least one of the intermediate variables, but there is difference in the scope for variation among variables. Also the degree of influence of the intermediate variables varies in diverse societies and within societies over a period of time.

In the past, several models have been devised for developed countries to model fertility as one of the key determinants of population change (Bermúdez et. al., 2012; Hoem et al. 1981) but fitting such models for Nigeria data is yet to be extensively explored. Though there are many fertility models in the literature, few have been specifically generated to describe fertility patterns in Nigeria. Modelling fertility in Nigeria becomes necessary to facilitate a meaningful comparison of fertility across its regions. One of such models is Gompertz which was initially developed in 1825 to describe age patterns of mortality. However, its application as a fertility model started with the works of Wunsch (1966), Martin (1967) and Brass (1975, 1978). Bhat (2004) also proposed a generalized version of the Gompertz model which was used to relate a given empirical schedule to an appropriate standard schedule and now useful for modelling fertility schedules.

Method

Study area

The study was conducted using a representative data from the north-west and south-west Nigeria. In the north-west and south-west Nigeria, fertility is known to be highest and lowest among all the country's regional blocks based on the past 5 rounds of Demographic and Health Surveys conducted between 1990 and 2013. The 6 states In Nigeria that constitutes north-west are; Jigawa, Kaduna, Kano, Katsina, Kebbi, Sokoto and Zamfara while that of south-west are; Ekiti, Ondo, Oyo, Ogun, Osun and Lagos. Other regions in Nigeria are north-central, north-east, south-south, and south-east. The north-west are predominantly people of Hausa ethnic origin while south-west are the Yorubas. These two regions are different in socio-cultural background like religion, marital union formation, sexual health, literacy level, women socio-economic status, and other cultural identities. Trends in TFR in 1990, 2003, 2008, 2013 in the north-west and south-west are 6.6, 6.7, 7.3 6.7 and 5.6, 4.1, 4.5, 4.6 respectively (National Population Commission and ICF International, 2014).

Data collection:

Secondary data analyses of weighted sample of 2013 Nigeria Demographic Health and Survey (NDHS) was used for the study. The original data collection was designed to provide data that will examine the population and health situation including provision of current information on fertility levels in Nigeria. Administratively, Nigeria is divided into 36 states and the Federal Capital territory. Each state is subdivided into local government areas which are further divided into localities. The sample was selected using a stratified 3-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 and a fixed sample take of 45 households were selected per cluster.

Variables description:

The dependent variable was fertility measured by children ever born coded as variable v201 in the NDHS data but classified in this study as 0, 1-2, 3-4, 5+. The key independent variable is region classified as south-west and north-west since these are the regions of focus. Others include age, age at first sexual intercourse, age at first marriage, age at first birth and place of residence. Others are; ever used of modern contraceptive, wealth quintile, education, religion, number of union, sex preference and ideal family size.

Methods of Analyses:

Fertility levels:

Fertility levels were estimated using P/F ratio method based on the information on children ever born, number of children born during the year preceding the survey, and the total number of women in each 5-year age group. The estimation involved the following procedures (United Nations, 1983; Brass, 1975; Coale and Trussell, 1975);

- ✓ Computation of reported average parities,
- ✓ Derivation of preliminary fertility schedule,
- ✓ Calculation of cumulated fertility schedule $\phi(i)$ for a period $\phi(i) = 5\sum_{j=0}^{i} g(j)$,
- ✓ Estimation of average parity equivalents $G(i)$for a period.

- ✓ $G(i) = \phi(i-1) + \xi_1 g(i) + \xi_2 g(i+1)$,
- ✓ Calculation of a fertility schedule for conventional five year age group

$$g^{+}(i) = \big(1 - \acute{\eta}(i-1)\big)g(i) + \acute{\eta}(i)g(i+1)$$

Where;

$\acute{\eta}(i) = x(i) + y(i)g(i)/\phi(7) + z(i)g(i+1)/\phi(7)$,

- ✓ Adjustment of period fertility schedule $g^{*}(i) = \Omega g^{+}(i)$,
- ✓ Estimation of TFR from the expression $TFR = 5\sum_{i=1}^{7} g^{*}(i)$

Brass-relational Gompertz model

Fertility models are useful for smoothing the observed data obtained from verbal reporting of births. The usefulness of the Brass-relational Gompertz model is in the correction and adjustment of fertility data that are limited; deficient or defective that is typically encountered with data collected in censuses and surveys in developing countries. The Brass-relational Gompertz fertility model is often fitted to the observed data in order to determine the constants in the linear relationship between observed and standard Gompits. The standard has been constructed to portray the initial build-up of fertility realistically, and in a case where extra flexibility or a closer fit for a particular data set is required, we used different standard from the empirical data (Booth, 1984). The fitting of relational Brass-relational Gompertz model to observed fertility data was done in this study by the estimation of the TFR and parameters α and β. Brass-relational Gompertz model of fertility is directly similar to the Brass relational logit mortality model. As with the mortality model, the relational fertility model makes use of a standard fertility schedule that is linearized by means of a mathematical function (United Nations, 1983; Brass, 1975).

In this model, Brass postulated that the ratio of the cumulated fertility (F(x)) to the total fertility (TF) assumed to follow Gompertz distribution function of the form;

$$(F(x)/TF) = \exp\big(\acute{\omega}_0(\exp\acute{\omega}_1 x)\big) \qquad (1)$$

Where $\acute{\omega}_0$ and $\acute{\omega}_1$ are constants, $\acute{\omega}_0 < 0$. Thus,

$$\ln(-\ln(F(x)/TF)) = \ln(-\acute{\omega}_0) + \acute{\omega}_1 x \qquad (2)$$

A better fit to this model was obtained by substituting for the age variable x a function of x which was interpreted as a ς transformation of a specific standard fertility schedule. Thus transforming the equation to a linear function of the ς transformation of the standard

$$\varsigma\big(F(x)\big) = \alpha + \beta\varsigma\big(F_s(x)\big) \qquad (3)$$

This straight line was transformed into any other straight line by changing its slope and intercept, and then converted back into a fertility schedule by applying the anti-function used to linearize the standard schedule. The reverse transformation which converts the model "gompits" back into proportional fertility cumulants, is the double exponential (United Nations, 1983). The parameter α represents the extent to which the age location of childbearing in the population differs from that of the standard (negative values imply an older distribution of ages at childbearing than in the standard) and β is a measure of the spread of the fertility distribution (values greater than 1 imply a narrower distribution). The assumption of the choice of Brass-relational-Gompertz model for fertility analysis is that the population must be somewhat stable (United Nations, 1983). The assumption of stability is to some extent suitable for Nigeria, since its population growth rate has been approximately constant in the recent times and fertility and mortality figures slightly vary (National Population Commission and ICF International, 2014; National Population Commission and ICF International, 2009; PRB, 2015).

Fertility determinants:

Fertility was analysed using analysis of variance to compare the Children Ever Born (CEB) across each group of women. Furthermore, the variable CEB was dichotomized as low and high. Low fertility, if CEB<5 and High if CEB ≥5. Thus factors influencing high fertility in the two regions separately and as a pool were identified using binary logistic regression model. This is because the 1988 Nigeria population policy which was reviewed in 2004 specifies that a couple should endeavour to limit her family size to four. Also, there has been consistent reporting of average ideal family size of slightly above three children in Nigeria (National Population Commission and ICF International, 2014). Consequently, a woman who has given birth to more than four children in the Nigeria context is regarded as having high fertility. The logistic regression is of the form;

$$\log\left(\frac{\zeta_j}{1-\zeta_j}\right) = \gamma_0 + \gamma_1 x_1 + \gamma_2 x_2 + \cdots + \gamma_k x_k \qquad (4)$$

Where; ζ is the proportion of women who have more than four children and $\gamma_1, \gamma_2, \gamma_3, \ldots, \gamma_k$, are the regression coefficients to be estimated. x_1, x_2, $x_3, \ldots, x_k$ are independent variables such as age, age at first sexual intercourse, residence, level of education, etc.

Parity progression:
The number of children a woman has is referred to as her parity and the proportion of women of a given birth cohort who go on to have another child on yearly basis as the women get older is known as a transition childbearing probability measured by;

$$\rho_j = 1 - \prod_{i=0}^{k}(1 - \varphi_i^{**}) \quad (5)$$

Where; $\varphi_x^{**} = \frac{n_{j+1}}{n_j - n_{p_{j+1}}}$ and n_{j+1} is the number of women who had their j^{th} birth in the x^{th} year before the current year and had their $(j+1)^{th}$ birth in the current year. n_j is the total number of women who had a j^{th} birth in the x^{th} year before the current year. $n_{p_{j+1}}$ is the number of these women who had their (j+1)th birth before the start of the current year.

Ethical approval:
Ethical approval was obtained from Nigeria National Ethics Committee (RNEC) functioning under the Ministry of Health, Nigeria. The data originators obtained an informed consent from all the study participants at the point of data collection and they were assured of confidentiality of the information they supplied. The consented participants were made to sign appropriate agreement form before the interview. Further, approval was granted from the data originators before use.

Results:
The refined total fertility rate using Brass P/F ratio was found to be higher in the North-West (7.96) than South-West (5.21) and in the two populations; the adjusted age specific fertility rates follow the usual dome shape patterns. However, in the North-West, the rural and urban TFR was 8.34 and 6.89 respectively. This pattern was found in the South-West but with lower values in both the rural and urban areas than that of the North-West. The rural women in the south-west (TFR=5.94) had lower fertility than the urban women in the north-west (TFR=6.89). The TFR of the urban women in the south-west and north-west was 4.27 and 6.89 respectively.

Table 1: Refined Total Fertility in the north-west and south-west Nigeria by background characteristics

	NORTH-WEST					**SOUTH-WEST**				
Age	*TW*	*P(i)*	*g(i)*	*g⁺(i)*	*g*(i)*	*TW*	*P(i)*	*g(i)*	*g⁺(i)*	*g*(i)*
	Total					Total				
15-19	2428	0.33	0.14	0.164	0.174	1121	0.07	0.04	0.051	0.046
20-24	2042	1.67	0.31	0.318	0.337	936	0.72	0.21	0.228	0.205
25-29	2151	3.49	0.32	0.320	0.340	1116	1.94	0.31	0.310	0.278
30-34	1623	4.99	0.30	0.295	0.313	1042	2.95	0.24	0.230	0.206
35-39	1399	6.67	0.23	0.224	0.237	900	3.93	0.15	0.141	0.126
40-44	1069	6.94	0.14	0.129	0.137	646	4.59	0.06	0.052	0.047
45-49	1164	8.22	0.06	0.050	0.053	554	5.04	0.01	0.007	0.007
		3.89	**7.5†**		**7.96††**		**2.42**	**5.1†**		**4.58††**
	Urban					Urban				
15-19	793	0.11	0.06	0.075	0.088	844	0.05	0.03	0.039	0.035
20-24	543	1.20	0.25	0.264	0.311	712	0.56	0.17	0.188	0.171
25-29	561	2.89	0.29	0.288	0.339	869	1.69	0.30	0.303	0.274
30-34	488	4.27	0.23	0.225	0.265	829	2.75	0.24	0.230	0.209
35-39	400	5.93	0.19	0.184	0.216	710	3.65	0.15	0.138	0.125

40-44	286	6.04	0.10	0.092	0.108	484	4.25	0.04	0.035	0.032
45-49	332	7.87	0.05	0.043	0.050	402	4.84	0.01	0.008	0.007
		3.28	**5.85**†		**6.89**††		**2.22**	**4.7**†		**4.27**††
	Rural					Rural				
15-19	1635	0.43	0.18	0.208	0.212	277	0.15	0.07	0.090	0.079
20-24	1500	1.84	0.33	0.334	0.34	224	1.23	0.33	0.350	0.308
25-29	1590	3.71	0.33	0.332	0.337	247	2.81	0.38	0.374	0.329
30-34	1135	5.31	0.33	0.326	0.331	214	3.72	0.27	0.257	0.226
35-39	999	6.96	0.25	0.243	0.248	189	5.00	0.16	0.157	0.138
40-44	783	7.26	0.16	0.148	0.15	162	5.60	0.13	0.116	0.102
45-49	832	8.36	0.06	0.049	0.05	152	5.56	0.01	0.007	0.006
		4.13	**8.2**†		**8.34**††		**3.07**	**6.8**†		**5.94**††

†Preliminary Total Fertility Rate; ††Refined Total Fertility Rate; TW: Total Women; P(i):Reported Average Parities; g(i):Preliminary Fertility Schedule; g(i):Refined Fertility Schedule*

The graphs of the adjusted age Specific fertility rate by rural-urban in north-west, south-west and Nigeria are shown in Figure 1 and these follow the usual pattern for any society. The data show consistent higher age specific fertility rates at all ages in the north-west than south-west and also higher than the national estimates.

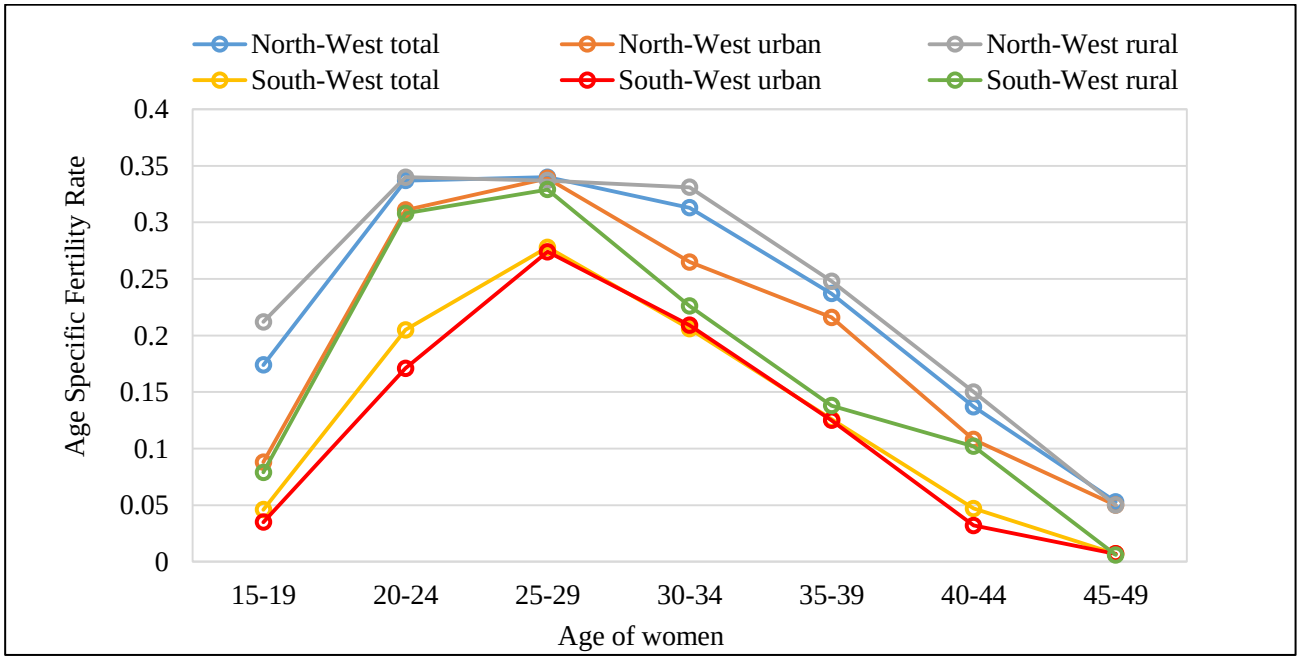

Figure 1: Age Specific Fertility Rate by Rural-Urban in North-West and South-West

Childbearing Progression Probabilities:

The estimated survival and transition childbearing probabilities are as shown in Table 2 Also displayed in the table are year and number of child birth to the cohort of women (born in 1964-1968) currently aged 45-49 years. The data show that none of these women from north-west and south-west Nigeria had birth earlier than 1976 but few women in age group 45-49 years are currently bearing children.

Table 2: Survival and Transition Childbearing Probabilities among women aged 45-49 years in North-West and South-West, Nigeria

Year of birth	Number of births	Survival Childbearing Probability	Transition childbearing Probability	Number of births	Survival Childbearing Probability	Transition childbearing Probability
	North-West Nigeria*(n=833)*			**South-West Nigeria*(n=467)***		
1975	0	1.000000	0.000000	0	1.000000	0.000000
1976	6	0.992700	0.007300	1	0.997800	0.002200
1977	17	0.972151	0.027849	3	0.991314	0.008686
1978	40	0.924807	0.075193	5	0.980608	0.019392
1979	66	0.850545	0.149455	8	0.963644	0.036356
1980	95	0.752222	0.247778	24	0.913727	0.086273
1981	101	0.659774	0.340226	20	0.874254	0.125746
1982	219	0.484010	0.515990	39	0.800642	0.199358
1983	179	0.378593	0.621407	56	0.703764	0.296236
1984	246	0.265280	0.734720	37	0.647533	0.352467
1985	223	0.193310	0.806690	81	0.534280	0.465720
1986	254	0.133577	0.866423	65	0.459267	0.540733
1987	312	0.082871	0.917129	104	0.356116	0.643884
1988	293	0.053336	0.946664	95	0.283041	0.716959
1989	274	0.035559	0.964441	104	0.219470	0.780530
1990	285	0.023231	0.976769	122	0.161639	0.838361
1991	234	0.016617	0.983383	115	0.121488	0.878512
1992	350	0.009541	0.990459	130	0.087374	0.912626
1993	286	0.006222	0.993778	126	0.063600	0.936400
1994	288	0.004042	0.995958	127	0.046154	0.953846
1995	282	0.002655	0.997345	116	0.034593	0.965407
1996	255	0.001831	0.998169	114	0.026076	0.973924
1997	281	0.001206	0.998794	117	0.019487	0.980513
1998	240	0.000854	0.999146	83	0.015993	0.984007
1999	224	0.000621	0.999379	97	0.012642	0.987358
2000	254	0.000429	0.999571	120	0.009365	0.990635
2001	185	0.000333	0.999667	68	0.007990	0.992010
2002	230	0.000239	0.999761	69	0.006799	0.993201
2003	195	0.000183	0.999817	71	0.005757	0.994243
2004	196	0.000139	0.999861	58	0.005036	0.994964
2005	185	0.000108	0.999892	43	0.004568	0.995432
2006	164	0.000086	0.999914	38	0.004193	0.995807
2007	110	0.000075	0.999925	36	0.003867	0.996133
2008	121	0.000064	0.999936	21	0.003691	0.996309
2009	88	0.000057	0.999943	18	0.003547	0.996453
2010	69	0.000052	0.999948	12	0.003456	0.996544
2011	45	0.000049	0.999951	15	0.003344	0.996656
2012	51	0.000046	0.999954	6	0.003300	0.996700
2013	14	0.000045	0.999955	1	0.003293	0.996707

In Figure 2, the data show that women aged 45-49 years who are residence of north-west Nigeria bear children at higher rate (0.2686) than that of their counterparts in the south-west (0.1709) throughout the years of childbearing.

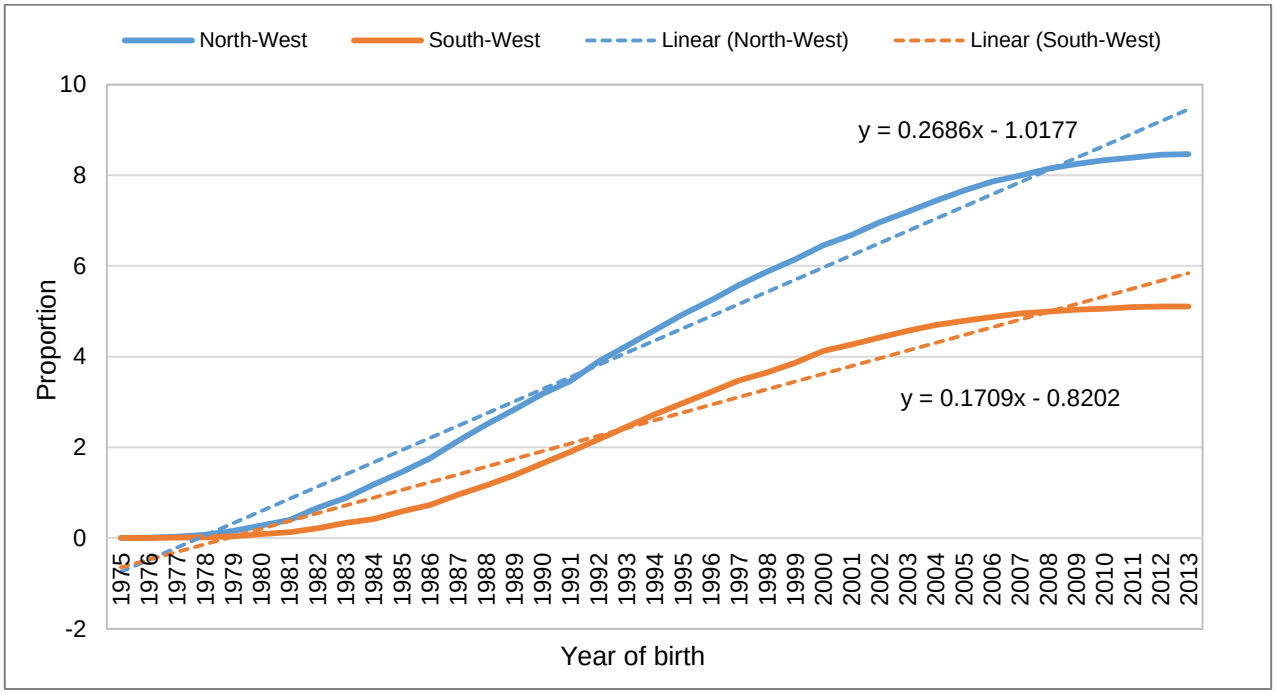

Figure 2: Childbearing progression rate in North-West, South-West and Nigeria

In Figure 3, the data show that the transition probabilities were consistently lower in the south-west than the north-west in the period 1976-2013. The pattern was similar to the survival probabilities but in a reverse order.

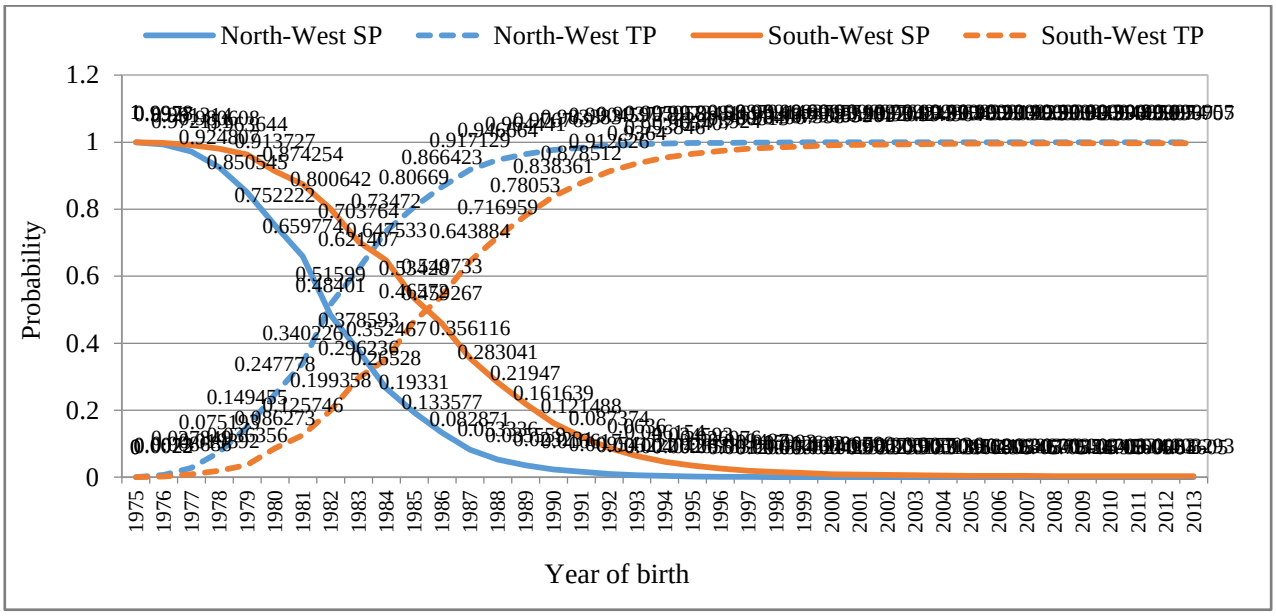

Figure 3: Survival Probability (SP) and Transition Probability (TP) in North-West and South-West Nigeria

Estimation of Brass-relational Gompertz parameters α *and* β*:*

Table 3 shows the Brass-relational Gompertz parameters estimates in south-west and north-west Nigeria. The estimated values of α for North-West and South-West show that the extent at which the age location of childbearing in the North-West (α= -0.003:SE=0.083) differs from the standard was higher than that of the South-West (α= -0.032; S.E=0.95). However, in both the North-West and South-West, an older distribution of ages at childbearing was found than it exists in the standard. The values of β found in the two regions shows that the spread of the fertility distribution across ages in the South-West (β=0.888; S.E=0.032) was narrower than that of the North-West (β=0.604; S.E=0.028).

Table 3: Brass-relational Gompertz parameters estimates in south-west and north-west Nigeria

Age	$\eta_S(F(x))$	$ASFR_{NW}$	$ASFR_{SW}$	F_{NW}	F_{SW}	$\eta_{NW}(F(x))$	$\eta_{SW}(F(x))$
15	1.77306	0.03	0.02	0.03	0.02	1.71937	1.71607
16	1.49286	0.12	0.02	0.15	0.04	1.37916	1.58298
17	1.25061	0.19	0.00	0.34	0.04	1.14843	1.58298
18	1.04479	0.21	0.07	0.55	0.11	0.98293	1.35011
19	0.85927	0.23	0.10	0.78	0.21	0.84281	1.16665
20	0.69130	0.31	0.18	1.09	0.39	0.68726	0.95250
21	0.53325	0.26	0.21	1.35	0.60	0.57342	0.77076
22	0.38524	0.40	0.28	1.75	0.88	0.41529	0.57572
23	0.24423	0.29	0.23	2.04	1.11	0.30857	0.43581
24	0.10783	0.34	0.21	2.38	1.32	0.18841	0.31696
25	-0.02564	0.34	0.28	2.72	1.60	0.07120	0.16600
26	-0.15853	0.39	0.32	3.11	1.92	-0.06208	-0.00175
27	-0.29147	0.34	0.34	3.45	2.26	-0.17906	-0.18007
28	-0.42515	0.29	0.29	3.74	2.55	-0.28058	-0.33619
29	-0.56101	0.35	0.31	4.09	2.86	-0.40664	-0.51123
30	-0.70000	0.31	0.25	4.40	3.11	-0.52286	-0.66173
31	-0.84272	0.32	0.27	4.72	3.38	-0.64890	-0.83770
32	-0.99014	0.29	0.25	5.01	3.63	-0.77004	-1.01792
33	-1.14407	0.35	0.28	5.32	3.91	-0.90893	-1.24813
34	-1.30627	0.37	0.20	5.69	4.11	-1.09148	-1.43903
35	-1.47872	0.25	0.23	5.94	4.34	-1.22854	-1.69988
36	-1.66426	0.25	0.19	6.19	4.53	-1.38034	-1.96713
37	-1.86597	0.20	0.13	6.39	4.66	-1.51552	-2.19315
38	-2.08894	0.26	0.14	6.65	4.80	-1.71584	-2.50148
39	-2.33192	0.18	0.08	6.83	4.88	-1.87664	-2.72670
40	-2.62602	0.16	0.09	6.99	4.97	-2.04062	-3.05421
41	-2.95500	0.19	0.06	7.18	5.03	-2.27177	-3.34785
42	-3.32873	0.11	0.03	7.29	5.06	-2.43127	-3.53313
43	-3.75984	0.11	0.04	7.40	5.10	-2.61799	-3.84720
44	-4.25499	0.15	0.04	7.55	5.14	-2.93970	-4.30308
45	-4.80970	0.09	0.02	7.64	5.16	-3.19342	-4.64149
46	-5.41311	0.07	0.01	7.71	5.17	-3.44481	-4.86560
47	-6.12864	0.09	0.01	7.72	5.18	-3.48628	-5.15425
48	-7.07022	0.04	0.01	7.76	5.19	-3.67117	-5.56068
49	-8.64839	0.03	0.01	7.79	5.20	-3.83561	-6.25479
North-West: $\alpha = -0.003$; Standard Error $= 0.083$: $\beta = 0.604$; Standard Error $= 0.028$							
South-West: $\alpha = -0.032$; Standard Error $= 0.95$: $\beta = 0.888$; Standard Error $= 0.032$							

SW:South-West; NW: North-West; S: Standard

In Figure 4, the data show that the gompitz of fertility in the north-west deviates largely from the standard than that of the south-west particularly at ages above 31 years. However, at younger ages (15-30 years), the fertility gompitz for the north-west was in line with the standard while that of the south-west deviates slightly from it.

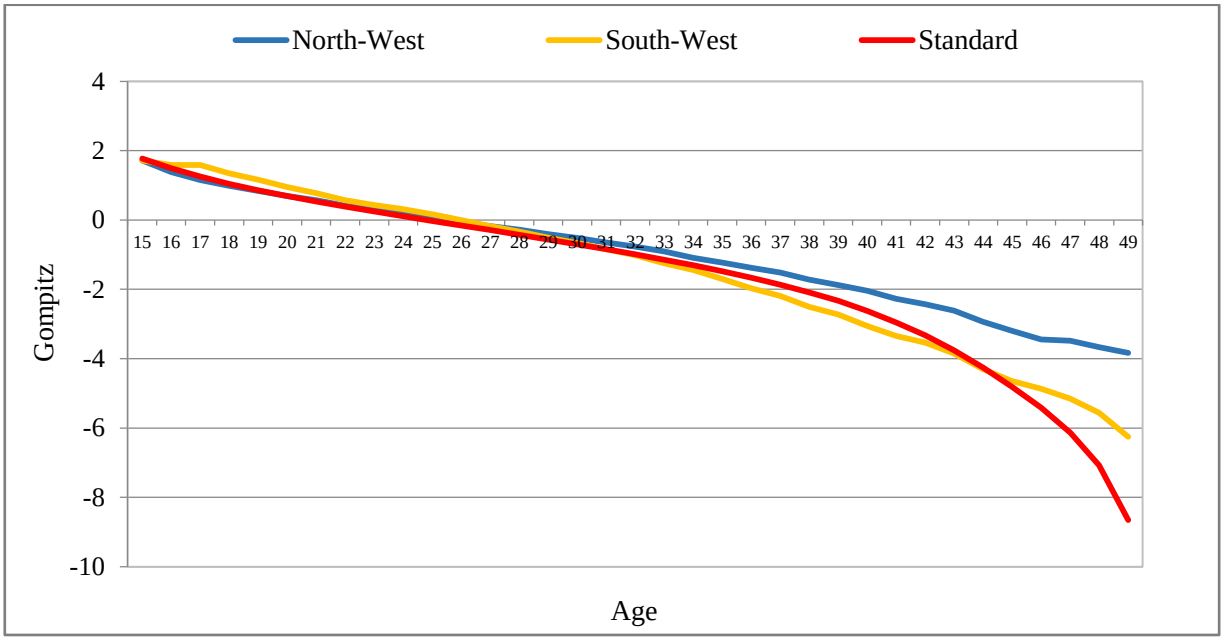

Figure 4: Deviance from the standard of the Gompitz of fertility by age in north-west and south-west Nigeria

Distribution of high fertility:

Figure 5 shows the distribution of children ever born in the north-west and south-west Nigeria. More women had given birth to 1-2 and 3-4 children in the south-west than north-west but the converse was found for births above 4 children with 44.4% of the women in the north-west having at least 5 children compared to 26.9% of their counterparts in the south-west.

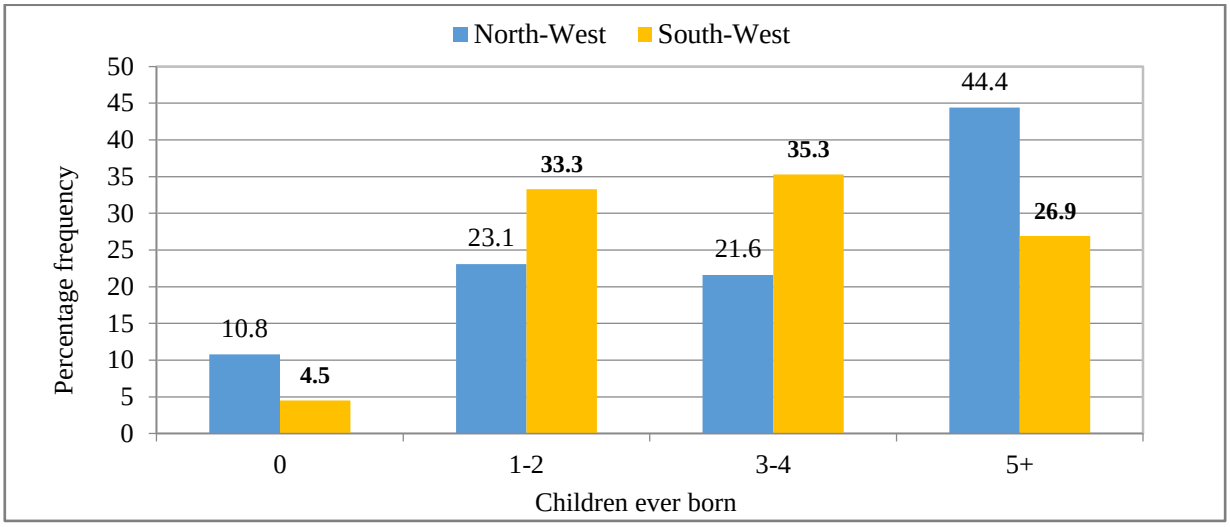

Figure 5: Children ever born in North-West and South-West Nigeria

Mean CEB±σ: North-West=4.42±3.3; South-West=3.36±2.0; p<0.001

In Table 4, the data show that the mean children ever born was significantly higher in the north-west (4.42±3.3) than that of south-west (3.36±2.0). But higher proportion of women in the south-west had given birth to 1-2 (33.3%) and 3-4 (35.3%) children than their counterparts in the north-west. ideal family size were found to be significantly associated with high fertility in south-west Nigeria. Except the place of residence which was not significantly associated with fertility, the pattern observed in the south-west was similar to that of Differentials exists in fertility measured by children ever born across the two regions. Variables such as age, age at first sexual intercourse, age at first marriage, age at first birth, place of residence, ever used of modern contraceptive, wealth quintile, education, religion, ethnicity, sex preference and north-west. The rural areas in the south-west (36.8%) had lower high fertility (CEB=5+) than that of the urban areas in the north-east (44.3%). Across the two regions, the proportion of women who experienced high fertility increases with increasing

level of education and increasing wealth index. Women who had married more than once had higher fertility than their counterparts in stable unions in the north-west (55.7% vs 42.8%) and south-west (47.0% vs 24.3%) regions. In the north-west, women who never used modern contraceptive had higher fertility than those who had ever used modern contraceptive but the converse scenario was found in the south-west.

Table 4: Distribution of respondents by high fertility in south-west and north-west Nigeria

Background variables	NORTH-WEST					SOUTH-WEST				
	CEB 5+	Total women	χ^2-value	Mean CEB±σ	F-value	CEB 5+	Total women	χ^2-value	Mean CEB±σ	F-value
Total	44.4	7783		4.42±3.3		26.9	3517		3.36±2.0	
Age			*5352.8**		*2185.5**			*1313.3**		*356.3**
15-24	0.7	2369		1.32±1.2		0.0	397		1.34±0.8	
25-29	29.2	1573		3.62±1.7		5.9	714		2.27±1.4	
30-34	64.6	1177		5.16±2.1		15.4	746		3.02±1.6	
35-39	81.1	1033		6.69±2.5		37.0	689		3.97±1.8	
40-44	81.8	793		7.13±3.0		50.0	504		4.62±2.0	
45-49	87.7	838		8.30±3.1		60.2	467		5.06±2.0	
Age at sexual initiation			*381.6**		*214.9**			*174.7**		*102.8**
8-14	54.5	3669		5.17±3.3		48.1	293		4.42±2.3	
15-17	37.9	3036		3.94±3.1		34.6	1016		3.83±2.1	
18+	28.5	1078		3.23±2.8		20.5	2208		3.01±1.9	
Age at first marriage			*387.2**		*142.7**			*367.4**		*134.1**
<15	54.5	3670		5.17±3.3		50.0	212		4.60±2.3	
15-17	38.2	2943		3.96±3.1?		43.2	600		4.21±2.1	
18-24	27.9	1064		3.23±2.8		26.1	1932		3.36±1.9	
25+	34.9	106		3.36±2.8		9.7	773		2.37±1.6	
Age at first birth			*7960.2**		*6772.6**			*3824.3**		*134.1**
12-17	56.2	3893		5.41±3.1		47.1	541		4.53±2.2	
18-24	42.1	2682		4.43±2.9		30.6	1954		3.63±1.9	
25+	38.5	366		4.03±2.4		10.6	864		2.66±1.5	
No child	0.0	842		0.0		0.0	158		0.0	
Place of residence			*7.532**		*0.272*			*73.4**		*91.3**
Urban	44.3	1674		4.39±3.1		23.1	2545		3.16±1.9	
Rural	44.5	6109		4.43±3.3		36.8	972		3.89±2.3	
Wealth index			*35.6**		*15.6**			*112.2**		*60.3**
Poor	46.2	5458		4.56±3.3		42.4	283		4.15±2.7	
Middle	40.8	1136		4.15±3.2		42.1	435		4.07±2.3	
Rich	39.7	1189		4.07±3.0		22.9	2799		3.18±1.9	
Education			*167.7**		*61.2**			*392.6**		*144.8**
None	47.5	6122		4.64±3.3		46.2	366		4.32±2.6	
Primary	41.4	864		4.17±3.1		41.0	837		4.16±2.0	
Secondary	22.9	686		2.98±2.5		22.9	1675		3.16±1.9	
Higher	34.2	111		3.37±2.5		7.8	639		2.32±1.5	
Religion			*54.6**		*333.3**			*10.5***		*3.2****
Christian	30.0	387		3.53±2.4		25.3	2395		3.31±2.0	
Islam	45.2	7342		4.47±3.3		30.2	1108		3.49±2.1	
Others	40.7	54		4.13±3.1		28.6	14		3.36±2.0	
Sex preference			*42.5**		*27.0**			*17.2***		*5.1***
None	46.4	5682		4.58±3.3		26.6	2437		3.40±2.1	
Female	36.9	1134		3.84±3.0		33.3	354		3.53±1.9	
Male	41.9	967		4.19±3.2		24.5	726		3.16±2.1	
Ideal family size			*194.3**		*82.3**			*700.2**		*358.3**
0-2	41.2	114		4.28±3.6		7.6	105		2.29±1.6	
3-4	14.5	345		2.25±2.4		11.2	1937		2.67±1.6	
5+	45.9	7324		4.53±3.3		48.9	1475		4.36±2.2	
Ever used contraceptive			*70.2**		*0.838*			*79.8**		*25.3**
Never used	44.6	7352		4.43±3.3		25.5	1575		3.17±2.2	
Ever used	41.1	431		4.39±2.5		28.0	1942		3.52±1.9	
Number of unions			*67.7**		*77.2**			*116.3**		*131.3**
1	42.8	6823		4.30±3.2		24.3	3113		3.22±2.0	
1+	55.7	960		5.28±3.3		47.0	404		4.45±2.1	

Significant at 0.1%;Significant at 1.0%; ***Significant at 5.0%; Mean age of the respondents: North-West=30.0±9.4; South-West=34.0±7.9; Mean age of women with high fertility: North-West=37.0±6.9; South-West=40.1±5.9*

Determinants of high fertility:

Multivariate logistic regression analysis was used to identify the predictors of high fertility in each of the regions and the two regions pooled together. Three models were generated. The first model (1) included the use of both demographic and other variables in the equation for each of the regions. In the second model, only the region was used while the third model included all variables in the regression model. It was found that the likelihood of experiencing high fertility was (OR= 2.18 C.I=1.99-2.37, p<0.001) higher in the north-west than south-west and this reduced (OR= 1.43, C.I=1.24-3.86, p<0.05) when other variables were introduced into the equation. The important predictors of high fertility in the two regions were; age, age at first sexual intercourse, age at first birth, ever used of modern contraceptive, wealth quintile, education, religion, ethnicity, sex preference and ideal family size but these factors were different from the predictors of high fertility found in each of the region. Other information are provided in Table 5.

Table 5: logistic regression analysis of high fertility by women characteristics in south-west and north-west Nigeria

Background Characteristics	**NW** *Model 1a* O.R(95% C.I)	**SW** *Model 1b* O.R(95% C.I	**NW&SW** *Model 2* O.R(95% C.I)	**NW&SW** *Model 3* O.R(95% C.I)
Region				
North-West			2.18(1.99-2.37)*	1.43(1.24-3.86)***
South-West			1	1
Age				
30-34	0.13(0.09-0.18)*	0.18(0.05-0.39)*		0.13(0.08-0.13)*
35-39	0.54(0.39-0.74)*	0.36(0.26-0.50)*		0.44(0.30-0.55)*
40-44	0.76(0.54-1.07)	0.73(0.52-1.02)		0.74(0.58-0.94)***
45-49	1	1		1
Age at sexual initiation				
8-14	1.29(0.54-3.07)	2.25(1.22-4.15)**		1.67(1.05-2.65)***
15-17	1.06(0.58-1.94)	1.17(0.85-1.58)		1.05(0.80-1.37)
18+	1	1		1
Age at first marriage				
<15	0.66(0.23-1.86)	2.39(1.07-5.32)***		1.11(0.62-1.95)
15-17	0.61(0.26-1.41)	3.20(1.84-5.57)*		1.32(0.87-1.99)
18-24	0.48(0.26-0.86)***	1.64(1.07-2.52)***		1.02(0.73-1.40)
25+	1	1		1
Age at first birth				
12-17	1	1		1
18-24	0.22(0.18-0.27)*	0.72(0.47-1.09)		0.27(0.22-0.31)*
25+	0.04(0.02-0.06)*	0.24(0.13-0.42)*		0.16(0.04-0.08)*
Place of residence				
Urban	1	1		1
Rural	0.98(0.77-1.25)	1.44(1.08-1.92)***		1.17(0.97-1.41)
Wealth index				
Poor	1.19(0.87-1.62)	1.75(1.07-2.85)***		1.31(1.02-1.67)***
Middle	0.93(0.68-1.26)	1.49(1.05-2.11)***		1.20(0.96-1.50)
Rich	1	1		1
Education				
None	1.10(0.59-2.04)	3.05(1.78-5.24)*		2.18(1.52-3.12)*
Primary	1.35(0.72-2.54)	2.85(1.85-4.37)*		2.58(1.83-3.62)*
Secondary	0.94(0.50-1.74)	2.41(1.61-3.60)*		1.92(1.39-2.65)*
Higher	1	1		1
Religion				
Christian	1	1		1
Islam	1.60(0.94-2.71)	1.10(0.86-1.40)		1.15(0.92-1.43)
Others	4.68(1.80-12.11)**	2.06(0.33-12.85)		3.39(1.53-7.49)**
Gender Preference				
None	0.97(0.77-1.219)	1.67(1.26-2.20)*		1.19(1.01-1.42)***
Female	0.82(0.61-1.09)	1.38(0.93-2.04)		1.01(0.80-1.27)
Male	1	1		1
Ideal family size				
0-2	1	1		1

3-4	0.81(0.37-1.77)	1.44(0.57-3.59)		0.85(0.50-1.42)
5+	3.19(1.67-6.09)*	8.74(3.48-21.91)*		4.56(2.78-7.46)*
Ever used contraceptive				
Never used	0.88(0.62-1.23)	0.54(0.42-0.68)*		0.67(0.55-0.80)*
Ever used	1	1		1
Number of unions				
1	1	1		1
1+	0.79(0.63-0.97)***	1.36(1.01-1.83)***		0.92(0.77-1.10)
-2logLogLL	***4569.145***	***2176.123***	***14786.242***	***6868.425***

*Age group 15-24 and 25-29 dropped because the number of subjects was too small; *Significant at 0.1%; **Significant at1.0%; ***Significant at 5.0%; O.R: Odds Ratio; NW: North-West; SW: South-West*

Discussion

Fertility is one of the principal components of population dynamics that determine the size, structure, and composition of the population in any country. This paper examines fertility levels and patterns in the north-west and south-west Nigeria. Fertility level of a nation is an integral part of its development assessment. Reduction in fertility over a period of 20 to 30 years when fertility rates fall due to significant reductions in childhood mortality rates is being described as demographic dividends. Despite the benefits of low fertility to a nation particularly the developing countries, transition from higher to lower fertility is yet to begin in Nigeria, the most populous nation in Africa. There has been consistent reporting of disparities in total fertility rate across the regions in Nigeria mainly as a result of its large population size, cultural diversities and socio-economic differential (National Population Commission and ICF International, 2014). In south-west region where the Yorubas mainly reside, the TFR is found to be least in four out of the fertility estimates from five demographic and health surveys conducted between 1990 and 2013 while the TFR was highest in the north-west over the period (National Population Commission and ICF International, 1991-2014). The striking difference in the TFR between the south-west and north-west regions in Nigeria raises a question on why the gap. Is the TFR estimate method used indeed provided the correct figure? How are the characteristics of women in the south-west different from that of north-west in terms of their fertility? Answers were provided to these questions in this study.

The conventional estimate of total fertility rate is often flawed with errors in birth reporting which characterises fertility data from African countries. Bearing this in mind, our refined TFR estimate was found to be higher in the north-west than south-west. This pattern is similar to the estimates provided in the DHS report for Nigeria (National Population Commission and ICF International, 2014). Bongaarts fertility model had identified contraceptive use as one of the key proximate determinants of fertility (Bongaarts, 1978). The south-west region has exhibited higher prevalence in contraceptive use than north-west (National Population Commission and ICF International, 2014) and this can explain one of the reasons for the gap in the TFR between the regions. The rate of progression in childbearing among women aged 45-49 years was higher in the north-west than their counterparts in south-west. Consistent reporting of higher modern contraceptive prevalence rate in the south-west than north-west between 1990 and 2013 (National Population Commission and ICF International, 1991-2014) can be attributed to the difference as women who were 45-49 years old in 2013 were 22-26 years in 1990, some of these women probably just began childbearing at this period.

The childbearing progression as an indicator of fertility provides a basis for inferring long-term trends in fertility among older women who are nearing the end of their reproductive period. It is an indicator of average completed fertility for women who began childbearing in the three decades prior to the survey. If fertility has been stable over time in a population, the TFR and the mean number of children ever born for women in age group 45-49 should be similar. If fertility levels have been falling, the TFR will be lower than the mean number of children ever born. The mean number of children ever born in the north-west and south-west to women age 45-49 was 8.3 and 5.1 respectively. This is about 0.3 more in the north-west and 0.5 more in the south-west than the current estimated TFR in the regions, signifying that fertility has decreased slightly over the past few decades. The study also showed that childbearing transition probabilities were consistently higher in the north-west than south-west. An implication of higher completed fertility in the north-west than south-west Nigeria. The extent at which the age location of childbearing in the north-west differs from the standard was higher than that of the south-west but the spread of the fertility distribution across ages in the South-West was narrower. The institution of polygamy which occasionally promotes rivalry for childbearing among co-wives and lower use of modern contraceptive among women in the north-west are important factors to be considered in this

finding (National Population Commission and ICF International, 2013).

Fertility as measured by children ever born was found to be higher in the north-west than south-west. In addition, higher proportion of women in the north-west than south-west had given birth to more than 4 children. These findings are in accordance with the outcome of a study previously conducted in Nigeria (Akpa and Osayomore, 2012). Many reasons can account for the gap in fertility between north-west and south-west as shown in our study. The north-west are predominantly Muslims, marry early and of lower literacy level particularly among women compared to the south-west (National Population Commission, 2006) and these factors have been identified in the literature (Fagbamigbe and Adebowale, 2014; Adebowale and Palamuleni, 2014) as important determinants of fertility in Nigeria. For instance, studies have shown that Muslim women bear more children on the average than the Christians (Fagbamigbe and Adebowale, 2014; Akpa and Osayomore, 2012). Also, culturally, marriage often marks the commencement of childbearing in any society in Nigeria. Therefore, early marriage exposes women to longer childbearing years than late marriage and this probably often leads to the risk of bearing more children for those who married early. Education is known to be a fundamental determinants of fertility as higher education can at times cause a delay in marriage and thus reduces the number of years of exposure to the risks of childbearing (Adebowale and Palamuleni, 2014). Also higher education is known to influence the use of modern contraceptive and indulging in activities that protects unwanted pregnancies (Adebowale et al., 2013). Herrnstein and Murray (1994) speculate on the "dysgenic" effects of the relatively high rates of fertility among persons with low education.

Rural women in the south-west had lower fertility than the urban women in the north-west. Although, limited comparative research has been conducted on fertility differential across the regions in Nigeria, the diversity in literacy level and traditional practices in the two regions as articulated in the preceding paragraph can clarify the reason for our finding. The main predictors accountable for the differential in high fertility (bearing at least 5 children including the current pregnancy) in the two regions are; age, age at first sexual intercourse, age at first birth, ever used of modern contraceptive, wealth quintile, education, religion, sex preference and ideal family size. However, the identified predictors of high fertility in each region were different. Aside the common predictors, age at first sexual intercourse, place of residence, wealth index, education, sex preference and ever used of modern contraceptive were found as determinants of high fertility in the south-west but not in the north-west, but only religion was found as a separate factor in the north-west. The fact that age at sexual initiation, residence, wealth index, education and sex preference have no association with high fertility in the NW is worth nothing. This is an indication of possible strong influence of some cultural instincts on some socio-economic variables as they relate to fertility in the NW. The implication of our finding is that women give birth to children in the NW irrespective of her; family's wealth status, their educational status, the place of residence and preference for sex.

Limitations

Report on birth histories is a useful approach to the generation of fertility models but the Demographic and Health Surveys data are often flawed with data quality problems which could be ascribed to either omission of births or inappropriately reporting of the birth dates or displacement of births(Pullum, 2006; Merli and Raftery, 2000). Also some caution should be taken when assessing trends in fertility from comparison of the TFR and mean number of children ever born to women aged 45-49 years because older women may underestimate their total childbearing experience and more often dead children might not be reported.

Conclusion

Fertility rate is high in the two regions but higher in the north-west than south-west. Noteworthy is the fact that higher fertility was found in the urban areas in the north-west than rural areas in the south-west. The speed of progression in childbearing was higher in the north-west than south-west. The factors found to be responsible for the gap in fertility in the two regions as identified in this study should be important while designing programmes aimed at reducing fertility in north-west Nigeria. Other regions in Nigeria with similar fertility level like north-west should learn from the experience of women in south-west in terms of their fertility behaviour as revealed in this study. Improving health education on fertility in the north-west particularly among those with passion for large ideal family size will facilitate low fertility in the region. Qualitative studies that explore context specific reasons for high fertility should be carried out in the north-west zone in Nigeria.

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