

ORIGINAL RESEARCH ARTICLE

A Comparative Analysis of Fertility Differentials in Ghana and Nigeria

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Abstract

Nigeria and Ghana are the most densely populated countries in the West African sub-region with fertility levels above world average. Our study compared the two countries' fertility levels and their determinants as well as the differentials in the effect of these factors across the two countries. We carried out a retrospective analysis of data from the Nigeria and Ghana Demographic Health Surveys, 2008. The sample of 33,385 and 4,916 women aged 15-49 years obtained in Nigeria and Ghana respectively was stratified into low, medium and high fertility using reported children ever born. Data was summarized using appropriate descriptive statistics. Factors influencing fertility were identified using ordinal logistic regression at 5% significance level. While unemployment significantly lowers fertility in Nigeria, it wasn't significant in Ghana. In both countries, education, age at first marriage, marital status, urban-rural residence, wealth index and use of oral contraception were the main factors influencing high fertility levels. (*Afr J Reprod Health* 2014; 18[3]: 36-47)

Keywords: Fertility differential, Educational level, ordinal logistic regression, Nigeria, Ghana

Résumé

Le Nigeria et le Ghana sont les pays les plus peuplés de la sous-région d'Afrique de l'Ouest avec des taux de fécondité supérieurs à la moyenne mondiale. Notre étude a comparé les taux de fécondité des deux pays et de leurs déterminants ainsi que les différences dans l'effet de ces facteurs dans les deux pays. Nous avons fait une analyse rétrospective des données de l'Enquête démographique de la santé du Nigeria et du Ghana, 2008. L'échantillon de 33 385 et des 4916 femmes âgées de 15-49 ans obtenus au Nigeria et au Ghana respectivement a été stratifié en basse, moyenne et haute en se servant des enfants qui ont été déclarés comme jamais nés. Les données ont été résumées en utilisant des statistiques descriptives appropriées. Les facteurs qui influent sur la fécondité ont été identifiés par la régression logistique ordinale au niveau de signification de 5%. Alors que le chômage diminue de manière significative la fertilité au Nigeria, ce n'était pas significatif au Ghana. Dans les deux pays, l'éducation, l'âge au premier mariage, l'état, civil, le milieu de domicile, l'indice de la richesse et de l'utilisation de la contraception orale ont été les principaux facteurs qui influent sur les niveaux de fécondité élevés. (*Afr J Reprod Health* 2014; 18[3]: 36-47)

Mots-clés: écart de fécondité, niveau de l'éducation, régression logistique ordinale Nigeria, Ghana

Introduction

Fertility is of great importance in contemporary demographic research as it is one of the greatest areas of discontinuity between National policies and individual goals. In less developed countries, the preferences of many individuals and groups for large families run counter to national policies to limit population growth in the face of low economic growth. Several factors have been identified to affect the relatively high levels of fertility in these countries. Fertility is one of the

three principal components of population dynamics that determine the size and structure of the population of a country. Differentials in fertility levels and pattern in different areas and among population strata or characteristics have been among the most pervasive findings in demography. Uncontrolled fertility would lead to poverty at both the household and national levels¹⁻³.

It is true that human fertility is a function of a variety of factors. A proper understanding of these factors would be of paramount importance in

tackling the problem of uncontrolled fertility which will pave the way for the improvement of the prevailing socioeconomic and demographic problems of the two countries. Awareness of these factors would contribute substantially to the improvement of the health status of women and children.

Dissimilarities in fertility preferences among couples in Sub-Saharan Africa are common and well documented⁴⁻⁷. In a study of couples' fertility and contraceptive decision-making in 18 developing countries⁶, it was shown that less than half of the couples in the study agreed on the same number of children or a one-child difference (implying even lower proportion of couples that agree if the one child difference is excluded). Higher ages and educational attainment of husbands compared to their wives have also been shown to affect reproductive preferences and behavior⁸. However, there has not been much evidence of women having dominance per se on fertility issues. Even higher educational attainment by women especially in the West African coastal region does not give them autonomy or pre-eminence over their reproductive intentions and actions⁹.

Nigeria and Ghana are the two most densely populated countries in the West African sub region, accounting for over 70% of the total population in the sub-region. According to the 2008 reports of the World Health Organization¹⁰, Ghana has a population of over 24 million people and a population growth rate of 2.2% while Nigeria has over 158 million people and a population growth rate of 2.4%. Nigeria is indeed the most populous country in Africa and the seventh most populous in the world, ranked after China, India, United States, Indonesia, Brazil, and Pakistan while Ghana is ranked, twelfth in Africa and the forty-eighth in the world¹¹. The fertility levels and total children ever born in Ghana are 3.6 and 2.3 respectively, while Nigeria has 4.4 and 2.8 respectively^{12,13}. The Total Fertility Rate (TFR) in Ghana and Nigeria are 4.2 and 5.6 respectively compared with the world TFR of 2.4 and 1.6 for the more developed countries¹⁴.

However, reporting of fertility, its trends and determinants in Ghana and Nigeria has not been satisfactory compared to what is available in

developed countries partly due to low levels of research on fertility and primarily due to lack of reliable vital registration systems from which fertility data can be collected routinely in these countries. The vital registration system is poorer in Nigeria and the level of fertility and its influence on her population dynamics are largely estimated from other sources.

Nigeria and Ghana are countries that have been ravaged by economic challenges which result in decreasing per Capita Income annually¹⁵⁻¹⁶. In spite of being blessed with abundant valuable natural resources, significant portions of its people are living under extreme poverty. With about 2.3% population growth rate estimated annually, the situation in these countries clearly illustrates the truism that demographic and developmental factors reinforce each other. High fertility and rapid population growth exert negative influences when there is poor economic and social development. The rapid population growth in Nigeria is an issue of immense concern given the scarce resources of members of the society¹⁷. Significant improvement in the standard of living in Africa would remain a mirage unless population growth is slowed. Most Africans live under \$1.00 per day and going by the world bank statement that "On the current trends, Africa will increasingly be unable to feed its children and find jobs for its school leavers"¹⁸, the high fertility prevalence in Africa is a source of concern. The explanation for such differential fertility in terms of spatial consideration has presented a challenge of enormous dimension¹⁷.

Usually, female education is believed to influence family size decisions both by reducing desired family size and increasing women's ability to implement their reproductive preferences⁸. While it has been shown that desired family size has an inverse association with education among women, the relationship between education and desired family size among the males is also negative¹⁹. This implies that education has a reducing influence on the family size decisions of the males also. Given that on the average, men are more likely to have more education or be of similar educational attainment as the women, the demand for children by couples with high educational attainment will be low, although not

necessarily the same⁶. Having low fertility outcome in households with a high educational level cannot therefore be equated to the woman's enhanced control over her fertility. It has also been argued that, education enhances economic autonomy and general decision making of women but, not their reproductive decision making within marriage⁹. However, women's educational attainment is expected to have some influence on women's reproductive autonomy through improved couple communication and negotiation on family issues.

The Demographic and Health Survey serves as one of the richest sources of demographic information in Nigeria and Ghana but the findings are grossly under-utilized largely because of sketchy analysis of the data collected. Therefore, the National Demographic and Health Survey data in Nigeria and Ghana have been examined in this work to estimate fertility levels and compare the main determinants in Nigeria and Ghana.

Thus, we evaluated the effect of basic socio-demographic factors such as education, age, age at first marriage, age at first sexual intercourse on the fertility level in Nigeria and Ghana. Also, we compared the effects of the socio-demographic factors on fertility in both countries and identified similarities and differences in factors that might have contributed to the decline or increase in fertility.

Methods

This is a retrospective analysis of data collected from a cross-sectional study of the 2008 Demographic and Health Surveys in Nigeria (NDHS)¹³ and Ghana (GDHS)¹², the fourth of its kind conducted in Nigeria and the fifth in Ghana since the commencement of Demographic and Health Surveys (DHS) in 1988. The 2008 NDHS is a nationally representative sample of 33,385 women aged 15-49 years and 15,486 men aged 15-59 years. While the 2008 GDHS sampled a total of 4,916 women age 15 – 49 years and 6,141 men aged 15 – 59 years, only the data for the women was analysed in this study. The survey covered all 36 states of Nigeria and participants were selected through a stratified two stage cluster design while the 10 regions in Ghana as well as the rural and urban areas were selected using a two stage

sampling technique. Details of the survey methodology have been reported¹²⁻¹³.

To enhance good comparison, we grouped each woman into only one of high, medium, and low fertility groups according to children ever born (CEB) as greater than four, two to four and one or no CEB respectively. as adapted for total fertility levels²⁰⁻²¹. The data were analyzed with the Statistical Package for Social Sciences [SPSS] for windows version 20.0. Summary statistics were computed for the socio-demographic factors and other factors affecting fertility. Using CEB as our dependent variable, we examined respondents' age, marital status, occupational status, education, wealth index, contraception use, age at first marriage, household headship as the independent variables using an ordinal regression model. All non-statistically significant independent variables in the bivariate analysis as well as independent variables with collinearity were excluded from the ordinal regression analyses. A probability level of 0.05 was considered statistically significant.

Ordinal logistic regression (OLR) is used to model nominal outcome variables, in which the log odds of the outcomes are modeled as a linear combination of the predictor variables²²⁻²⁴. It fits maximum likelihood models with discrete dependent variables with more than two outcome categories and these categories don't necessarily have natural ordering.

Considering the categories 1, 2, 3, : : : , m recorded in y, and the explanatory variables X. Assuming that y=1 if respondent has low fertility, y=2 if respondents has medium fertility and y=3 if respondents has high fertility where 1,2 and 3 are not ordered. In the ordinal logit model, a set of coefficients, $\beta^{(1)}$, $\beta^{(2)}$ and $\beta^{(3)}$ corresponding to each category is estimated:

$$P(y = 1) = \frac{e^{X\beta^{(1)}}}{e^{X\beta^{(1)}} + e^{X\beta^{(2)}} + e^{X\beta^{(3)}}} \dots\dots\dots(1)$$

$$P(y = 2) = \frac{e^{X\beta^{(2)}}}{e^{X\beta^{(1)}} + e^{X\beta^{(2)}} + e^{X\beta^{(3)}}} \dots\dots\dots(2)$$

$$P(y = 3) = \frac{e^{X\beta^{(3)}}}{e^{X\beta^{(1)}} + e^{X\beta^{(2)}} + e^{X\beta^{(3)}}} \dots\dots\dots(3)$$

One of the coefficients $\beta^{(1)}$, $\beta^{(2)}$ and $\beta^{(3)}$ would then be set arbitrarily to 0. If we set $\beta^{(1)} = 0$, the remaining coefficients $\beta^{(2)}$ and $\beta^{(3)}$ will measure the change relative to the y = 1 group. The

coefficients will differ because they have different interpretations, but the predicted probabilities for $y = 1, 2, \text{ and } 3$ will still be the same.

Setting $\beta^{(1)} = 0$ equation (1), (2) and (3) become

$$P(y = 1) = \frac{1}{1 + e^{X\beta^{(2)}} + e^{X\beta^{(3)}}} \dots\dots\dots(4)$$

$$P(y = 2) = \frac{1}{e^{X\beta^{(1)}} + 1 + e^{X\beta^{(3)}}} \dots\dots\dots(5)$$

$$P(y = 3) = \frac{e^{X\beta^{(3)}}}{e^{X\beta^{(1)}} + e^{X\beta^{(2)}} + 1} \dots\dots\dots(6)$$

Respectively. The relative probability of $y=2$ to the base outcome is

$$\frac{P(y=2)}{P(y=1)} = e^{X\beta^{(2)}} \dots\dots\dots(7)$$

Which is the relative risk ratio. Assuming that X and $\beta_k^{(2)}$ are vectors equal to $(x_1 + x_2 + \dots + x_i \dots + x_k)$ and $(\beta_1^{(2)} + \beta_2^{(2)} + \dots + \beta_i^{(2)} + \dots + \beta_k^{(2)})$. then, the ratio of the relative risk for a one-unit change in x_i is

$$\frac{e^{\beta_1^{(2)} x_1 + \dots + \beta_i^{(2)} x_{(i+1)} + \dots + \beta_k^{(2)} x_k}}{e^{\beta_1^{(2)} x_1 + \dots + \beta_i^{(2)} x_i + \dots + \beta_k^{(2)} x_k}} = e^{X\beta^{(2)}} \dots\dots(8)$$

Thus the exponentiated value of a coefficient is the relative-risk ratio (rrr) for a one-unit change in

the corresponding variable (risk is measured as the risk of the outcome relative to the base outcome). This is the ratio of the probability of choosing one outcome category over the probability of choosing the baseline category and it is also sometimes referred to as odds^{22,23,25,26}.

Results

A total of 4,916 and 33,385 records from Ghana and Nigeria were respectively analysed. The demographic characteristics showed almost an equal proportion of respondents within similar age group in the two countries. About 72% of the women from Nigeria were currently married compared with 60% from Ghana. Also 32.7% of the women had secondary education in Nigeria compared with 50.6% observed in Ghana and more than a third of Nigerian women had no formal education compared to a quarter in (25.3%) Ghana (Table 1a). Over 80% of women in both countries did not use contraceptives 86.8% and 81.3% in Nigeria and Ghana respectively. There was a statistically significant gap in the proportion of women with high fertility in Nigeria (30.2%) compared to 20.2% in Ghana (Table 1b).

Table 1a: Socio demographic characteristics of respondents from Nigeria and Ghana

Variables	Nigeria Frequency (%) N=33385	Ghana Frequency (%) N=4916	Chi square	P value
Age Group				
15 – 24	12694(38.0)	1906(38.8)	21.32	0.0001
25 – 34	10860(32.5)	1453(29.6)		
35 – 44	6926(20.7)	1122(22.8)		
>45	2905(8.7)	435(8.8)		
Marital Status				
Never Married	8021(24.0)	1546(31.4)	346.323	0.0001
Currently Married	23954(71.8)	2950(60.0)		
Formerly Married	1409(4.2)	420(8.5)		
Residence				
Urban	10489(31.4)	2162(44.0)	305.617	0.0001
Rural	22896(68.6)	2754(56.0)		
Education				
No Education	13242(35.8)	1243(25.3)	735.641	0.0001
Primary	6591(19.7)	999(20.3)		
Secondary	10905(32.7)	2489(50.6)		
Higher	2647(7.9)	181(3.7)		

Household Head				
Male	27749(83.1)	3133(63.7)	1031.254	0.0001
Female	5636(16.9)	1783(36.3)		
Wealth Index				
Poorest	7282(21.8)	1089(22.2)	20.229	0.0005
Poorer	6819(20.4)	921(18.7)		
Middle	6582(19.7)	897(18.2)		
Richer	6546(19.6)	1024(20.8)		
Richest	6156(18.4)	985(20.0)		
Working				
No	13683(41.0)	1210(24.6)	486.163	0.0001
Yes	19449(58.3)	3670(74.7)		

Table 1b: Reproductive behavior and characteristics of Nigeria and Ghana DHS 2008

Variables	Nigeria Frequency (%) N=33385	Ghana Frequency (%) N= 4916	Chi square	P value
Contraceptive Use				
No	28982(86.8)	3995(81.3)	110.132	0.0001
Yes	4403(13.2)	921(20.2)		
Ideal No of Children				
Never Married	4155(12.4)	87(1.8)	2938.453	0.0001
< 2	686(2.1)	48(1.0)		
2 – 4	8751(26.2)	3140(63.9)		
> 4	19793(59.3)	1641(33.4)		
Age at first Marriage				
Never Married	8021(24.0)	1546(31.4)	651.947	0.0001
<15	7018(21.0)	306(6.2)		
15 – 19	11363(34.0)	1799(36.6)		
20 – 23	4100(12.3)	805(16.4)		
>23	2883(8.6)	460(9.4)		
Age at First Intercourse				
Never Married	4583(13.7)	771(15.7)	196.024	0.0001
<15	3681(11.0)	315(6.4)		
15 – 19	11938(35.8)	2366(48.1)		
20 – 23	3113(9.3)	613(12.5)		
>23	905(2.7)	142(2.9)		
Fertility level				
Low	13272(39.8)	2268(46.1)	211.443	0.0001
Medium	10029(30.0)	1657(33.7)		
High	10084(30.2)	991(20.2)		

There were statistically significant associations between level of fertility measured by children ever born and age of women, marital status, education, residence, occupation, wealth index,

household head, age at 1st Marriage, age at 1st sexual intercourse and contraceptive use ($p < 0.05$) in the analysis of women's level of fertility and socio-demographic characteristics (Table 2).

Table 2: Association between Fertility levels and the Socio demographic characteristics of respondents

	Variables	Nigeria				P-	Ghana				P-value
		N	Low	Mediu	High		N	Low	Medi	High	
Age Group	15 – 24	12694	79.1	20.0	0.9	<0.00	1906	88.7	11.1	0.3	0.0001
	25 – 34	10860	24.0	48.2	27.8		1453	31.2	57.1	11.7	
	35 – 44	6926	6.8	25.8	67.4		1122	10.1	42.0	48.0	
	>44	2905	5.0	16.0	78.9		435	2.5	33.6	63.9	
Married status	Never	8021	98.5	1.4	0.2	0.0001	1546	98.1	1.9	0.1	0.0001
	Currently	23954	21.3	39.2	39.5		2950	22.1	48.2	29.7	
	Formerly	1409	18.5	38.4	43.1		420	23.6	49.3	27.1	
Residence	Urban	10489	47.3	30.1	22.6	<0.00	2162	88.1	11.3	0.6	0.0001
	Rural	22896	36.3	30.0	33.7		2754	73.3	25.2	1.5	
Education	No Formal	13242	22.1	32.9	45.0	0.0001	1243	19.1	38.6	42.3	0.0001
	Primary	6591	27.9	33.6	38.5		999	40.4	36.7	22.8	
	Secondary	10905	63.9	24.2	11.9		2489	60.4	30.2	9.4	
	Higher	2647	58.5	30.4	11.0		181	67.4	30.9	1.7	
Household head	Male	27749	36.5	31.5	32.0	0.0001	3133	41.9	34.9	23.1	0.0001
Head Sex	Female	5636	55.9	22.7	21.4		1783	53.9	31.6	14.9	
Wealth Index	Poorest	7282	29.5	31.5	39.0	0.0001	1089	33.0	33.8	33.2	0.0001
	Poorer	6819	31.5	30.8	37.7		921	39.5	33.7	26.8	
	Middle	6582	38.8	28.8	32.3		897	44.0	36.3	19.6	
	Richer	6546	48.4	27.7	23.9		1024	53.9	33.7	12.4	
	Richest	6156	52.8	31.3	15.9		985	60.7	31.3	8.0	
Contraceptive Use	No	28982	40.1	29.4	30.6	0.0001	3995	48.6	32.2	19.2	0.0001
	Yes	4403	37.7	34.5	27.8		921	35.5	40.4	24.1	
Occupation	No	13683	56.2	23.7	20.1	0.0001	1210	81.7	13.3	5.0	0.0001
	Yes	19449	28.0	34.6	37.3		3670	34.3	40.5	25.1	
Ideal No of Children	No	4155	28.9	27.8	43.3		87	27.6	34.5	37.9	
	< 2	686	39.4	26.2	34.4	0.0001	48	54.2	31.2	14.6	0.0001
	2 – 4	8751	63.6	28.6	7.8		3140	56.8	33.4	9.7	
	> 4	19793	31.5	31.3	37.2		1641	26.4	34.2	39.3	
Age @ 1st Marriage	No	8021	98.5	1.4	0.2		1546	98.1	1.9	0.1	
	< 14	7018	14.4	33.1	52.5	0.0001	306	17.0	40.2	42.8	0.0001
	15 – 19	11363	21.7	38.4	39.9		1799	18.2	47.9	42.8	
	20 – 23	4100	23.4	46.2	30.4		805	25.6	52.0	22.4	
	> 23	2883	32.5	46.3	21.2		460	36.3	48.9	14.8	
Marriage Age @ 1st Intercourse	No	4583	100	0.0	0.0		771	100	0.0	0.0	
	< 14	3681	23.6	30.7	45.8	0.0001	315	39.4	33.0	27.6	0.0001
	15 – 19	11938	35.3	33.7	31.0		2366	38.8	39.3	21.9	
	20 – 23	3113	45.2	35.9	18.9		613	46.5	39.6	13.9	
	> 23	905	43.0	39.7	17.3		142	54.2	40.1	5.6	

The ordinal logistic regression to determine the relationship between independent predictors of high fertility in Nigeria showed that women aged 35 – 44 years are 33% less likely to report having high fertility against low fertility than those who are 44 years and above (OR=0.67, 95% CI = 0.505-0.897). Also, the odds of high fertility among Nigerian women against low fertility level are 3.8 times higher among women with primary education compared to those with higher education (OR = 3.810, 95% CI = 2.901-5.002). Nigerian

women with no work were 0.4 times less likely to have a high fertility against low fertility compared to those who were working (OR = 0.624, 95% CI = 0.548 - 0.710). In Ghana, women who were currently married were about twice likely to have high fertility against low level fertility as compared to the formerly married (OR = 2.098, 95% CI = 1.265 – 3.479). This odds is higher for Nigerian women who were currently married and were about two and half times more likely to have high fertility level against low fertility as

Table 3: Independent predictors of High Fertility in Ghana and Nigeria

Predictor	Nigeria OR(95% CI)	p-value	Ghana OR(95% CI)	p-value
Age				
15 – 24	.000(.000-.000)	<0.0001	-	-
25 – 34	0.06(0.04-0.07)	<0.0001	0.01(0.00-0.02)	<0.0001
35 – 44	0.67(0.51-0.89)	0.007	0.23(0.11-0.47)	<0.0001
>44	Ref		Ref	
Marital Status				
Never Married	0.12(0.06-0.24)	<0.0001	0.12(0.02-0.99)	<0.0001
Currently Married	2.54(1.94-3.33)	<0.0001	2.09(1.26-3.48)	0.004
Formerly Married	Ref		Ref	
Residence				
Urban	1.04(0.89-1.23)	0.629	0.77(0.51-1.16)	0.205
Rural	Ref		Ref	
Education				
No Education	2.54(1.92-3.38)	<0.0001	17.09(4.35-67.02)	<0.0001
Primary	3.81(2.91-5.00)	<0.0001	13.27(3.42-51.43)	<0.0001
Secondary	2.01(1.57-2.58)	<0.0001	4.32(1.15-16.17)	0.029
Higher	Ref		Ref	
Household Head				
Male	1.15(0.32-1.38)	0.149	1.654(1.143-2.392)	0.008
Female	Ref		Ref	
Wealth Index				
Poorest	1.18(0.90-1.52)	0.242	3.57(1.82-6.98)	<0.0001
Poorer	1.61(1.25-2.07)	<0.0001	2.78(1.51-5.10)	0.001
Middle	1.68(1.33-2.12)	<0.0001	3.17(1.81-5.55)	<0.0001
Richer	1.15(0.94-1.42)	0.174	1.17(0.72-1.93)	0.526
Richest	Ref		Ref	
Use Contraceptive				
No	0.38(0.32-0.45)	<0.0001	0.36(0.24-0.51)	<0.0001
Yes	Ref		Ref	
Have Occupation				
No	0.62(0.55-0.71)	<0.0001	0.76(0.45-1.29)	0.315
Yes	Ref		Ref	
Age@ 1st Marriage				
< 14	31.19(23.96-40.62)	<0.0001	14.91(6.99-31.73)	<0.0001
15 – 19	14.53(11.73-18.01)	<0.0001	9.48(5.61-16.01)	<0.0001
20 – 23	4.54(3.66-5.61)	<0.0001	5.04(2.94-8.62)	<0.0001
> 23	Ref		Ref	
Age@ 1st Sexual intercourse				
< 14	3.29(2.37-4.58)	<0.0001	12.85(4.3-38.13)	<0.0001
15 – 19	1.84(1.38-2.48)	<0.0001	8.87(3.48-22.92)	<0.0001
20 – 23	1.11(0.82-1.49)	0.508	2.84(1.06-7.44)	0.037
> 23	Ref		Ref	
Ideal No. of Children				
< 2	0.74(0.47-1.17)	0.200	0.19(0.04-0.97)	0.045
2 – 4	0.17(0.14-0.20)	<0.0001	0.27(0.19-0.40)	<0.0001
Over 4	Ref		Ref	

compared to those who were not in unions (OR = 2.537, 95% CI = 1.935-3.327) Table 3.

Also, Ghanaian women with no education are about 17 times more likely to be in a high fertility

category than low fertility when compared to those with higher education (OR = 17.094, 95% CI = 4.359 – 67.026). This odds was lower among Nigerian women where those without any formal

Table 4: Independent predictors of Medium fertility in Ghana and Nigeria

Predictors	Nigeria		Ghana	
	OR(95%CI)	p-value	OR(95%CI)	p-value
Middle fertility				
Age				
15 – 24	0.67(0.05-0.89)	<0.0001	0.01(0.00-0.03)	<0.0001
25 – 34	0.52(0.39-0.68)	<0.0001	0.13(0.06-0.25)	<0.0001
35 – 44	1.12(0.84-1.49)	0.425	0.42(0.21-0.84)	0.015
>44	Ref		Ref	
Marital Status				
Never Married	0.11(0.07-0.15)	<0.0001	0.19(0.11-0.34)	<0.0001
Currently Married	1.67(1.34-2.07)	<0.0001	1.55(1.07-2.24)	0.22
Formerly Married	Ref		Ref	
Residence				
Urban	1.02(0.91-1.15)	0.7	1.17(0.86-1.55)	0.328
Rural	Ref		Ref	
Education				
No Education	1.34(1.09-1.68)	0.005	1.62(0.91-2.90)	0.105
Primary	1.84(1.51-2.24)	<0.0001	1.78(1.02-3.10)	0.041
Secondary	1.39(1.18-1.65)	<0.0001	1.13(0.69-1.85)	0.621
Higher	Ref		Ref	
Household Head				
Male	0.98(0.85-1.12)	0.77	1.24(0.95-1.58)	0.117
Female	Ref		Ref	
Wealth Index				
Poorest	0.91(0.74-1.12)	0.372	2.44(1.48-4.00)	<0.0001
Poorer	1.03(0.85-1.25)	0.723	1.81(1.66-2.80)	0.008
Middle	1.18(0.99-1.41)	0.059	2.36(1.59-3.49)	<0.0001
Richer	0.94(0.81-1.09)	0.428	1.07(0.77-1.48)	0.684
Richest	Ref		Ref	
Contraceptive Use				
No	0.51(0.45-0.59)	<0.0001	0.59(0.45-0.75)	<0.0001
Yes	Ref		Ref	
Occupation				
No	0.72(0.65-0.79)	<0.0001	0.68(0.00-0.93)	0.015
Yes	Ref		Ref	
Age@1st Marriage				
< 14	6.14(4.93-7.64)	<0.0001	3.53(1.98-4.29)	<0.0001
15 – 19	4.24(4.93-5.04)	<0.0001	4.01(2.78-5.78)	<0.0001
20 – 23	2.44(2.08-2.85)	<0.0001	2.66(1.87-3.77)	<0.0001
> 23	Ref		Ref	
Age @1st Sex Intercourse				
< 14	1.72(1.34-2.21)	<0.0001	2.26(1.18-4.29)	0.013
15 – 19	1.35(1.10-1.65)	0.003	2.22(1.37-3.59)	0.001
20 – 23	1.06(0.86-1.31)	0.56	1.25(0.76-2.05)	0.372
> 23	Ref		Ref	
Ideal No. of Children				
Never Married	0.93(0.80-1.08)	0.333	0.44(0.19-0.99)	0.048
< 2	0.76(0.53-1.09)	0.137	0.56(0.17-1.84)	0.341
2 – 4	0.63(0.56-0.70)	<0.0001	0.69(0.52-0.93)	0.014
Over 4	Ref		Ref	

education were about 2.5 times more likely to be in a high fertility level as against low fertility compared to those with the higher education (OR = 2.547, 95% CI = 1.917-3.383). Also Ghanaian

women living in urban areas were about 24% less likely to have high fertility against low fertility as compared to those living in the rural areas (Table 3). The pattern in Nigeria suggested urban women dwellers are about 4% more likely, but this finding was not statistically significant in each country. $P > 0.05$. The women in the poorer and middle wealth index category and those who did not use oral contraception were more likely to be in the high fertility category as against to low fertility when compared to those out of any marital union. $P < 0.001$. Also women who married before attaining age 20 years in both countries had higher chance of being in the high fertility category as against low fertility when compared to those who married after 23 years. $p < 0.001$. The odds ratio was stronger in Nigeria than Ghana, while it was almost 31 times more likely to be in the high fertility category for those who married before attaining age than 15 years in Nigeria, it was only about 15 times in Ghana. The age at first sex revealed the same pattern.

Table 4 also showed that odds of medium fertility is lower (83%) among Ghanaian women aged 25 – 34 years compared to those aged 44 years and above (OR = 0.126, 95% CI = 0.0624 – 0.250). The educational status of women had an overall significant effect on the number of children that women would have in their life time ($p < 0.0001$), Ghanaian women with primary education were 1.8 times more likely to have medium fertility against low fertility as compared to those with higher education (OR = 1.781, 95% CI = 1.024-3.100). Although not statistically significant, Ghanaian women living in urban areas were 1.2 times more likely to have medium fertility against low fertility as compared to those living in rural areas (OR = 1.157, 95% CI = 0.864 – 1.549). Furthermore, the odds of medium fertility against low level fertility is 32% less likely among the non-working Ghanaian respondents compared to those that were working (OR = 0.681, 95% CI = 0.452 – 0.753) ($p < 0.05$). In Nigeria, respondents in the age group 25 – 34 years tend to have lower odds of medium fertility against low level fertility when compared to those aged 44 years and above (OR = 0.521, 95% CI = 0.399-0.680). Also, Nigerian women with primary education were about 1.8 times more likely to have a medium

fertility compared to those with higher education (OR = 1.842, 95% CI = 1.515 – 2.240). The odds of medium fertility against low fertility were also much higher among currently married Nigerian women compared to those formerly married. Location was not associated with medium fertility level against low fertility.

Discussion

The NDHS 2008 and GDHS 2008 respectively revealed some similar characteristics in the basic socio-demographic fertility variables. But the fact that a higher proportion of Nigeria women were currently married can be attributed to socio-cultural factors in Nigeria which may not affect unmarried Ghanaians from having children. Indeed a slightly higher proportion of Ghanaian women are more educated than their Nigerian counterpart a situation that can delay early marriage in Ghana. Also that more Nigerian women lived in the rural areas compared to Ghana facilitates the likelihood of early and more marriages in Nigeria compared to Ghana.

However, the pattern of fertility in the two countries which appeared to increase with increasing age is normal and logical. The older ones are more likely to have stayed in marriage and more likely of having more births.

The findings in the present study that showed that rural women have higher fertility than urban women is consistent with previous reports from developing countries like Nepal, Ethiopia and Cameroon²⁷⁻³¹ where rural dwellers were reported to be more likely to have higher fertility compared to their urban counterparts. One plausible explanation is the social life in urban cities with its attendant economic activities that may limit sexual activities and delayed marriages. Apart from this studies have shown a higher use of contraceptives among urban than rural women dwellers and that women who live in rural areas tend to marry at a younger age than those in urban areas³²⁻³³.

We observed in this study that level of educational attainment had a statistically significant effect on the number of children that women would have in their life time. This finding is in consonance with previous reports by other researchers that educated women are more likely

to postpone marriage, and use contraception than uneducated women and hence have smaller family sizes^{27,34}. Education exposes women to information, empowers women, makes them more likely to be employed outside their home environment, and makes them more aware of their own health and the health of their children and this explains while educated women have lower number of children than those not educated. Thus the finding that women with primary education have lesser fertility compared to those with no formal education in both countries is quite logical and not surprising. Our study further revealed that education played a significant role in the determination of rural and urban fertility differentials in both countries, a finding consistent with the findings reported in Zimbabwe³⁵. The authors of the Zimbabwe study reported that uneducated women who lived in societies where a large proportion are literate or where educational level is high, had a fertility rate different from that of uneducated women elsewhere. They also found the more educated a community is, the better understanding of issues concerning fertility. Also, the realization of education as a liberating force and a window of opportunities which every parent must strive to afford for their children particularly females affect fertility decisions¹²⁻¹³. However, a recent American study indicated that although school entry policies affect female education and the quality of a woman's mate and have generally small, but possibly heterogeneous, effects on fertility and infant health³⁶. They argued that school entry policies were used to manipulate primarily the education of young women at risk of dropping out of school.

A striking finding in this study was that less than half of the females had their first sexual encounter before the age of fifteen; even more alarming is the fact that some of them began having intercourse at an early age of 12 years. In both countries and also in most parts of Africa, early sexual experiences particularly among females are regarded as culturally unacceptable and violate social norms. A decrease in the average age at first marriage and sexual debut has an adverse effect on high fertility. Those women who get married at early age will be exposed to an early sexual intercourse which in turn may lead to

many teenage pregnancies. Apart from the negative effect it poses on women's health, this culture of early marriage/sexual intercourse has a greater likelihood of having many children as reported in an Indian study³⁷. We have used a secondary data for this analysis, which usually comes with its limitations. The number of Children Ever Born (CEB) could have been underestimated as some women might not include dead children especially those that happened during infancy either intentionally or due to recall bias. Again the cross sectional design for this study suggest that all the variables analysed in the regression model can only provide evidence of a statistical association between those variables and fertility level and cannot show a cause-effect relationship. In addition, the number of CEB suffers from problems of truncation and censoring as it only include the number of children born up to specific points in women's childbearing years and not the number of children they would have had at the end of their reproductive year.. However, the NDHS and GDHS are nationally representative samples and this enhances the external validity of the study.

Conclusion

Human population is a vital issue in sustainable development plan. It is a strong determinant of the socio-economic and political prosperity of a nation. However, rapid population growth in the absence of commensurate material and financial resources could constitute a significant problem in society; consequently, factors that influence regional population growth is of great importance to policy makers, researchers and students. We assessed the effect of basic socio-demographic factors on fertility levels in Nigeria and Ghana. Many factors that contribute to this phenomenon are similar in both countries. The age of women, marital status, education and occupation are important and strong predictors that affect fertility. This study also revealed that women with education beyond the primary level had lower fertility levels. Since female education beyond the primary level is known to enhance women's access to power and control over resources affecting fertility, the efforts of the Nigerian and

Ghanaian governments should be directed at encouraging the female education to facilitate any policy aimed at controlling population growth. We therefore recommend that government and nongovernmental agencies should embark on public enlightenment campaigns to create awareness of the importance of fertility control. Government should encourage education of the girl child and also regulate the age of entry into marital unions. Stakeholders should gear-up awareness campaign on the use of contraceptives especially in rural areas of Nigeria.

Acknowledgement

We thank Measure DHS as well as Population Commissions and Councils in Ghana and Nigeria for releasing the data used for this study.

Contribution of Authors

EAB and OO conceived the study, EAB, AFF, JOA, OBY designed the study, AFF and OO analysed the data, EAB, AFF and OO wrote the result, AFF wrote the methodologies, EAB, AFF, JOA, OBY and OO wrote the introduction and the discussion. All authors proofread and agreed on the final manuscript.

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