Article

Modelling Trends in Contraception Usage in Nigeria and Ghana

SAGE

Christopher Godwin Udomboso[1,2]
A. Y. Amoateng[1]

Abstract

This study examines trends in contraception usage using Demographic and Health Survey (DHS) data from Nigeria (2013) and Ghana (2008, 2014). We used a cubic spline to estimate values between intervals, analysed using the time-series neural network model and forecasting till 2030. Results show contraception usage increasing with an average rate of 4.4 per cent, desire not to use declining at an average rate of 0.7 per cent and the use of modern contraception increasing at an average rate of 5.1 per cent. Use of traditional contraception is still increasing in Nigeria at a rate of 0.6 per cent but declining in Ghana at a rate of 0.3 per cent. By 2030, injectables would be mostly used, while the withdrawal method will be preferred among those still in favour of the traditional method. These trends show the readiness of the two countries to embrace the use of modern contraception in an effort to promote the campaign for Planned Parenthood and Family Programme.

Keywords

Trends, contraception, statistical neural network, forecast

Introduction

The World Health Organization recognized the use of contraceptive methods and treatment of involuntary fertility as keys to achieving family planning (WHO, 2011). Contraception alongside abortion is a means of fertility control, the ones occurring primarily before gestation and the other after (Lauro, 2011). Both for the married and unmarried effective contraception prevents unwanted and unintended pregnancies and it is estimated to reduce maternal mortality by 25 per cent (Zhang, Patuwo, & Hu, 1998). Currently, contraceptive usage (condom) is the only means proven to significantly reduce the risk of sexually transmitted infections and HIV/AIDS transmission in heterosexual intercourse (David, 2008).

[1] School of Research and Post-Graduate Studies, North-West University (Mafikeng Campus), North West Province, South Africa.
[2] Department of Statistics, University of Ibadan, Ibadan, Oyo State, Nigeria.

Corresponding author:
Christopher Godwin Udomboso, School of Research and Post-Graduate Studies, North-West University (Mafikeng Campus), North West Province, South Africa.
E-mail: cg.udomboso@gmail.com

According to a recent Cochrane review, the consistent use of male condoms results in 80 per cent reduction in the risk of HIV transmission among HIV-serodiscordant couples (Virtalaab et al., 2006).

Review of Literature

About 94.5 per cent of Ghanaians (male and female) have heard about contraception, with about 80 per cent having used contraception and about 70 per cent currently using one contraceptive or the other (Michael & Kelson, 2014)—a far cry from Don Lauro (2011)'s report of 19.3 per cent of Ghanaian women aged 15–44 having used contraceptives for those who have had sex and about 13.5 per cent been exposed to modern methods. Globally, about 56 per cent of all married women are using a modern method of contraception up from the 2004 report of less than 10 per cent in 1960. The increase is driven by a growing demand for modern methods of contraception but has only been made a reality through the availability of and access to contraceptive supplies and health workers qualified to provide family planning service (Pacque-Margolis et al., 2013). Ninety-six per cent of women attending family planning clinics in Nigeria know at least one method of contraception (Awusi, 2012). As of 2008, about 15.4 per cent of Nigerian women who had sex had used contraceptive with about 10.5 per cent of them exposed to the modern methods. Some studies (Marston & Cleland, 2003; Westoff, 2005) have demonstrated that abortion levels are strongly linked to contraceptive use pattern, and further researches to substantiate the trend are needed.

The growth rate of contraceptives in Nigeria is classified low at about 3.5 per cent and the factors that determine choices vary from one region to the other (Ibrahim & Sadiq, 1999). A desire for large family size, poverty, ignorance and religious beliefs among others are to blame for the low acceptance of contraceptives (Kabir et al., 2003). Religious beliefs and fear of side-effect decisions of partners ranked high among Ghanaians as factors affecting the usage of contraceptives. Awusi (2012) classified choices of contraception to include condoms/cervical cap/diaphragm, oral contraceptive pills, injectables, an intrauterine contraceptive device (IUCD)/Norplant and sterilization. Michael and Kelson classified them as barrier methods (condom) and hormonal methods (injectables, pills and an intrauterine device [IUD]). Sterilization is most preferred in the developed countries of America and Britain (Emuveyan & Dixon, 1995). In Nigeria, the common method is injectable contraception because of its availability, cost-effectiveness and no-need-for-surgery method of application (Ameh & Sule, 2007), while Ghanaians favoured the barrier method, injectable coming up behind pills (Michael & Kelson, 2014). The major source of awareness and sensitization on contraception in Nigeria is the nurse and midwives with about 55 per cent coverage and influence, but for Ghanaians, the media played the big role next by the health personnel in sensitizing the populace (Michael & Kelson, 2014).

Statistical Neural Network and Forecasting

The statistical neural network (SNN) is a veritable tool in forecasting (Sharda, 1994) in different fields of business, industry and science (Widrow, Rumelhart, & Lehr, 1994). Reasons for this stem from the fact that they are data-driven self-adaptive methods (Zhang et al., 1998). The SNNs have the ability to learn from past examples and capture subtle functional relationships among the data regardless of the features or knowledge of its underlying relationship. Some authors (Cheng & Titterington, 1994; Ripley, 1993; White, 1989) refer to them as multivariate nonlinear nonparametric statistical methods.

Data and Methods

Measure of Variables

The focus of this study is the trends in the usage of contraception by women in the reproductive age in two countries in West Africa, namely, Nigeria and Ghana. The data used for this study were obtained from the most recent demographic and health surveys of the two countries. In the case of Nigeria, we used the final document of the 2013 report, while for Ghana, the final documents for the 2008 report and the 2014 report which contained only key indicators (since the 2014 final document is yet to be released) were used. The data set consists of the different categories of contraception, namely, 'any method (AM)', 'any modern method (AMM)', 'any traditional method (ATM)' and 'not currently using (NCU)'. These were used as dependent variables, while the 'years (or period)' were the independent variables. The AM refers to any of the modern or traditional methods that are available in the two countries. For AMM, the following methods were used: 'pill', 'IUD', 'injectables', 'male condom', 'female sterilization' and 'lactational amenorrhoea method (LAM)'. In the case of ATM, some of the methods are slightly different in the two countries, perhaps due to slight cultural differences. In Nigeria, the following traditional methods were used: 'rhythm', 'withdrawal' and 'folk method'. However, in Ghana, the traditional methods include 'periodic abstinence', 'withdrawal' or 'any other'. The NCU data set consists of women not using AM of contraception as on the period of data collection. The data set consists of the percentages of women using the different methods listed above since the inception of Demographic and Health Survey (DHS) data collection in the two countries. Data on AM were obtained by means of the question on whether the woman uses contraception at all, while the other two were more specific on whether the woman uses the modern or traditional method and which of the device in the two methods.

Cubic Spline Interpolation

Since DHS data are collected at intervals (in most cases, 5-year interval), the dependent variables, which consist of data on the contraceptive methods, are disjointed. Such data on many occasions do not produce precise forecast. Therefore, we used the cubic spline interpolation technique to estimate values between the intervals. The simple analytical procedure for the cubic spline is given as follows:

Let x be the year (or period, as is in our data set) and y the per cent in the usage of a contraceptive method. Therefore, given $n + 1$ points (x_0, y_0) to (x_n, y_n), and without loss of generality, it is assumed that $x_0 < x_1 < \cdots < x_n$; then the cubic spline $S(x) = y$ is given as follows:

$$S_i(x) = \frac{z_{i+1}}{6h_i} h_{i-1}^3 + \frac{z_i}{6h_i} h_i^3 + C_i h_{i-1} + D_i h_i$$

where

$z_i \equiv S''(x_i),\ \forall\ 0 \leq i \leq n,$
$h_i \equiv x_{i+1} - x,$
$h_{i-1} \equiv x - x_i$ and
C_i and D_i are arbitrary constants of integration.

To solve for C_i and D_i, we use the conditions $S_i(x_i) = y_i$ and $S_i(x_{i+1}) = y_{i+1}$. This results into

$$C_i = \frac{y_{i+1}}{h_i} - \frac{h_i}{6} z_{i+1}$$

$$D_i = \frac{y_i}{h_i} - \frac{h_i}{6} z_i$$

This technique is suitable in determining the rates of change as well as cumulative change over an interval.

Time-series Neural Network

We used a combination of trend estimation in time series and SNN in the analysis of trends in the usage of contraception in the two countries. The SNN is a related family of models inspired by studies of brain functioning (Noujah & Kalhori, 2014; Sajid, Maqsood, & Rani, 2011). This model was chosen for the analyses due to its flexibility in handling data no matter its complexity, and it has applications in many fields of study. There is no singular definition for SNN, but Sajid et al. (2011) defined it as 'a massively parallel distributed processor that has a natural propensity for storing experimental knowledge and making it available for use'. The SNNs are family models (known as 'architectures'), which have intelligent structure and flexibility, and are 'competitors for traditional statistical modelling due to their power to "learn" mathematical relationships between a series of input and the corresponding output' (Noujah & Kalhori, 2014). They have been found to perform better than conventional statistical models.

The SNN architecture used in this study is the multilayer perceptron (MLP), also known as the feed-forward network (FFN). It is called so because the network connection flows in a forward direction from the input to the output without a feedback loop.

We recall a simple trend equation in a time series

$$y_t = \alpha + \beta X_t + e_t$$

where t = time or period, y_t = dependent variable in time or period (day, week, month, year), X_t = independent variable in time or period (day, week, month, year), α = trend intercept, β = trend coefficient and e_t = error (noise, stochastic term) associated with the trend model.

Combining this with an MLP model, we have

$$y_t = \alpha X_t + \sum_{h=1}^{H} \beta_h g\left(\sum_{i=0}^{I} \gamma_{hi} X_{it} \right) + e_{it}$$

where t = time or period; y_t is the dependent variable in time t; $X_t = (\mathbf{x_{0t}}, \mathbf{x_{1t}}, \dots, \mathbf{x_{It}})$ are the independent variables in time t, with ; $\mathbf{x_{0t}} \equiv 1$; $W = (\alpha, \beta, \gamma)$ are the weights of the network attached to the input layer, hidden layer and the transfer function, respectively; e_{it} is the noise normally distributed with mean 0 and variance σ^2; $g(.)$ is the transfer function; $h = 1, 2, \dots, H$ is the number of hidden units; and $i = 0, 1, \dots, I$ is the number of input units.

In the analysis, we used five hidden neurons with the sigmoid transfer function. The results of the cubic spline interpolation (y_t) were used as the dependent variables, while the years (X_t, in serial order from interpolation) were used as the independent variables.

Results and Discussion

Figure 1 is the graphs of contraception usage in Nigeria. It is noticed that the percentage of women using AM of contraception (modern or traditional) was on the increase from 1990 to about 2010. Between 2010 and 2013, there was neither increase nor decrease in the percentage of women using contraception. Specifically, the percentage of women using modern methods of contraception increased from 1990 to about 2007. Decline in the percentage of women using modern methods was noticed from 2010 to 2013. The percentage of women using the traditional method decreased in a step-wise manner till about 2001. Afterwards, a sharp and continuous increase was noticed from 2004 to 2013. The percentage of women that were not using any form of contraception, though high, decreased steadily and slowly till 2010 from where any noticeable change could no longer be seen.

Figure 2 shows the graphs of the usage of contraception in Ghana. For those women using any form of contraception, it is noticed that the percentage was constantly on a sharp increase from 1988, though the increase dwindled a bit between 1995 and 2000. In the same vein, the percentage of women specifically using modern methods of contraception also increased from 1988 to 2005. Then, there was a sharp decrease in usage till about 2009, from where another increase was recorded till 2014. The percentage of women using traditional methods of contraception experienced a sinusoidal curve. That is, an increase was recorded between 1988 and 1994; afterwards, a sharp decrease came up till about 2006. Then, another increase was seen through 2008. The percentage of women that were not using any form of contraception, though also high, decreased steadily and slowly till 2003.

Figure 3 shows the graphs of forecasts made for Nigeria till 2030. It is seen that the percentage of women who will use AM of contraception will continue to increase. The same is seen in the specific case of women who will use AMMs of contraception, as well as ATMs of contraception. However, the percentage of women who will use traditional methods will increase stepwise. The percentage of women who still will not use AM of contraception will still be high, though the decrease will be sharp.

Figure 4 is the forecast graphs of contraception usage in Ghana, which we have shown till 2030. The percentage of the usage of any of the contraception methods will also increase over the years till 2030. The same is also seen in the percentage of the usage of modern contraception. Percentage of women who will use traditional methods will decrease in the coming years till 2030. Also, those who will still refuse to use contraception of any form will be high, though decreasing.

Table 1 shows the effects of awareness of contraception, over the years, on the usage of methods of contraception in Nigeria and Ghana. It is shown that in both countries, the level of awareness campaign is yet to affect the usage of contraception. This is seen in high values of the beta coefficients (Nigeria: $\beta = 0.0442$, Ghana: $\beta = 0.0398$). However, for the AMM in Nigeria, the effect is high on injectables ($\beta = 0.000949$), followed by male condoms ($\beta = 0.00081$), then pills ($\beta = 0.000798$), LAM ($\beta = 0.000478$), IUD ($\beta = 0.000424$) and female sterilization ($\beta = 0.000147$). For ATM, rhythm method is more affected ($\beta = 0.0011$) than the withdrawal method ($\beta = 0.000903$) and the folk method ($\beta = 0.000414$). In Ghana, it is shown that in AMM, awareness affects the method of using pills more ($\beta = 0.0018$), followed by injectables ($\beta = 0.0013$), then male condoms ($\beta = 0.0011$), female sterilization ($\beta = 0.000604$) and IUD ($\beta = 0.000386$). The least affected in this group is LAM ($\beta = 0.000094$). Among the ATM, the most affected method is periodic abstinence ($\beta = 0.0033$), then withdrawal method ($\beta = 0.000759$) and finally other traditional methods ($\beta = 0.000283$).

The results in Table 2 show the analysis of the mean per cent of women who had used or not used any form of contraception from 1990 to 2013 in the case of Nigeria and from 1988 to 2014 in the case of Ghana. It is shown that 11.9 per cent of the women had used at least one method of contraception since the inception of the DHS survey in Nigeria, while in Ghana, women who had used a method of contraception were 19.2 per cent. Out of these, the per cent of women who had used AMM was 7.2 per cent in Nigeria,
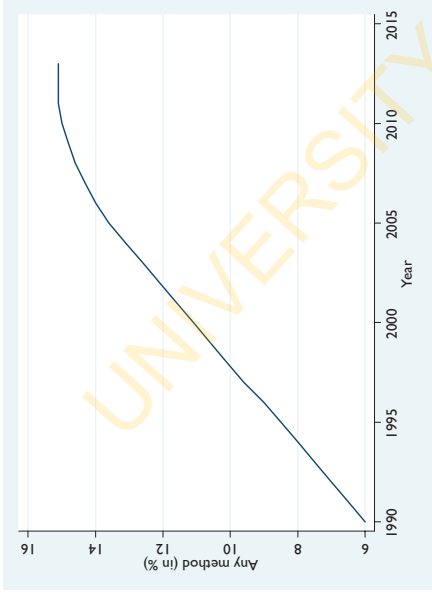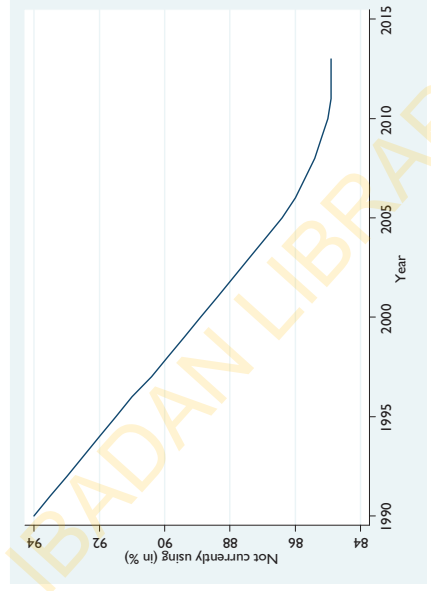
(a) Those using any methods of contraception
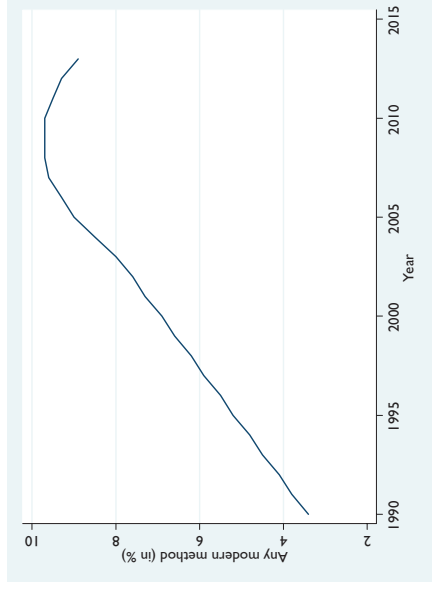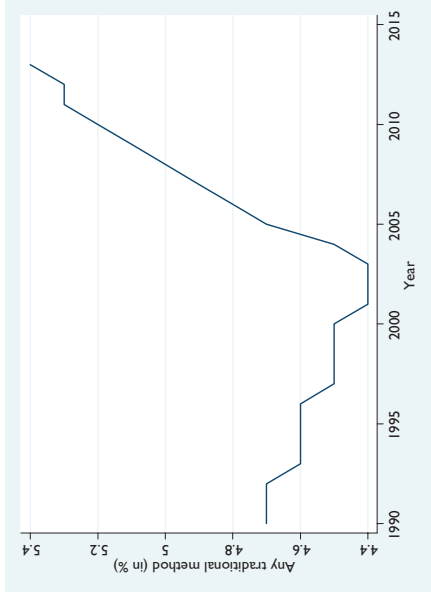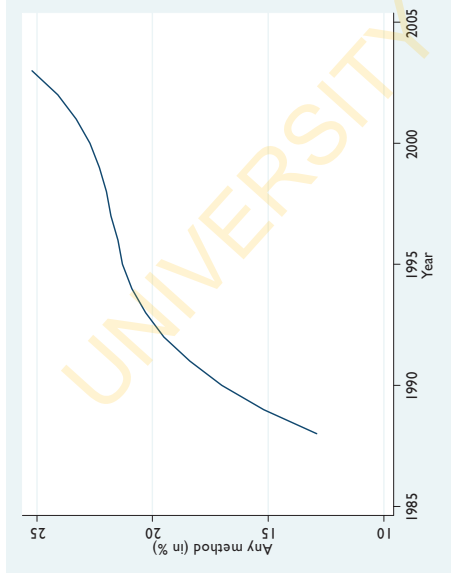
(b) Those using modern methods of contraception

(c) Those using traditional methods of contraception

(d) Those not currently using any contraception

Figure I. Graphs of Contraception Usage in Nigeria (1990–2013)

(a) Those using any methods of contraception

(b) Those using modern methods of contraception
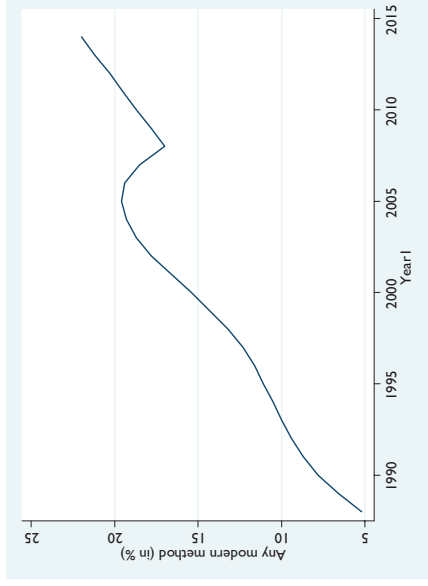
(c) Those using traditional methods of contraception

(d) Those not currently using any contraception

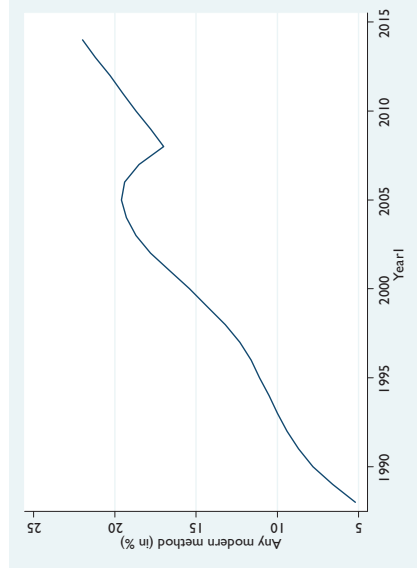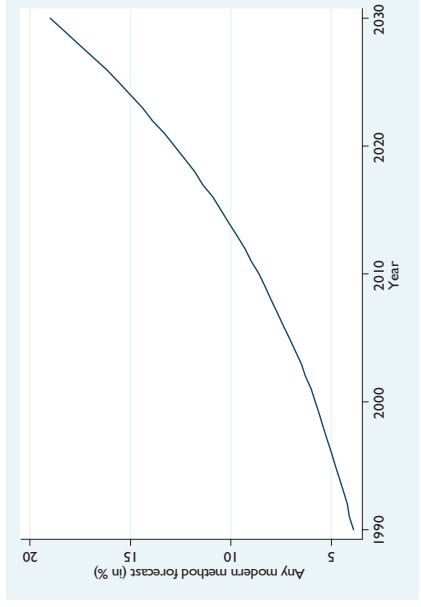**Figure 2.** Graphs of Contraception Usage in Ghana (1988–2014)

Source: Authors' own.

(a) Future usage of any methods of contraception

(b) Future usage of modern methods of contraception

(c) Future usage of traditional methods of contraception

(d) Future refusal to use any contraception

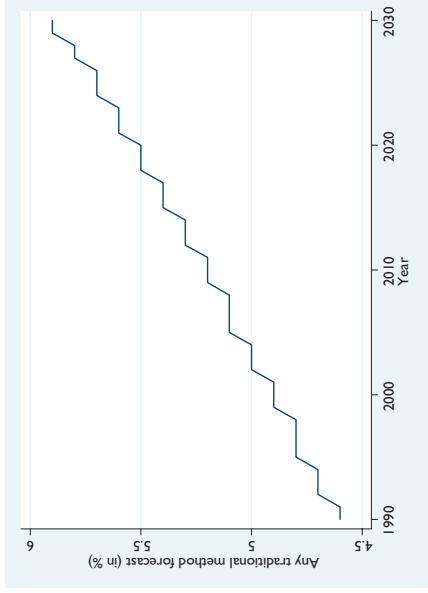**Figure 3.** Graphs of Forecasted Contraception Usage in Nigeria (1990–2030)
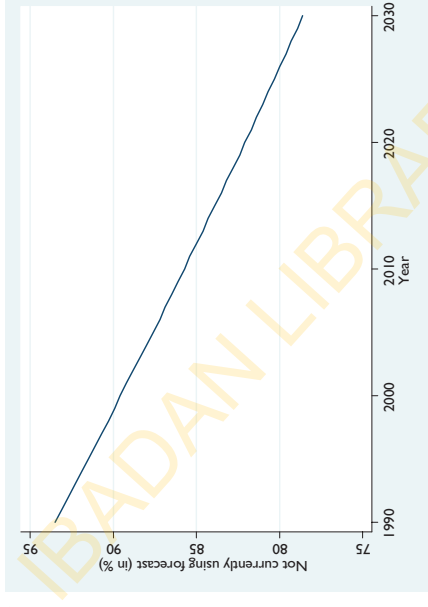
Source: Authors' own.

(a) Future usage of any methods of contraception

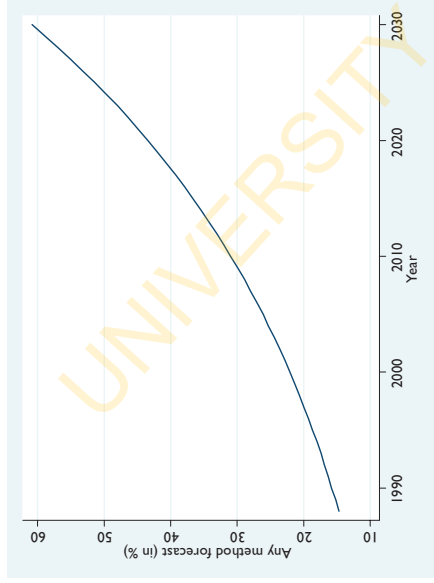(b) Future usage of modern methods of contraception

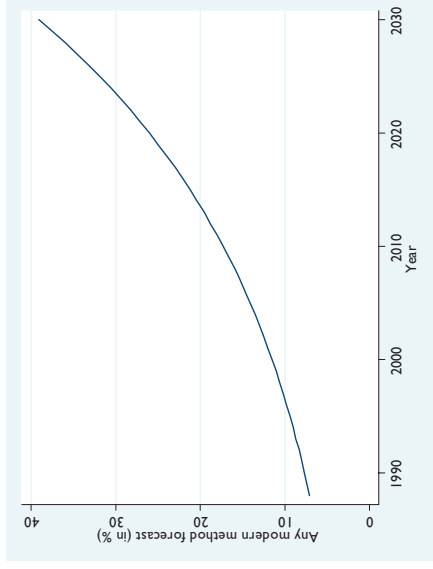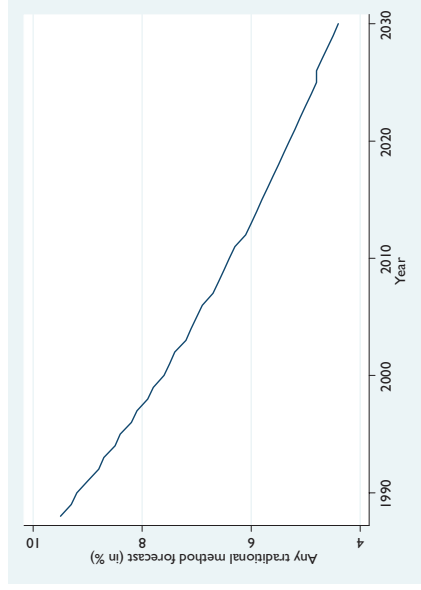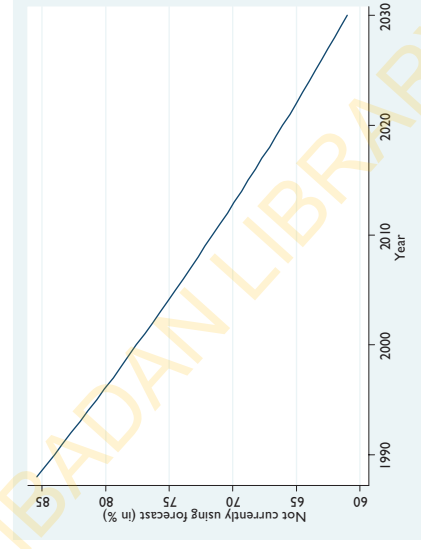(c) Future usage of traditional methods of contraception

(d) Future refusal to use any contraception

Figure 4. Graphs of Forecasted Contraception Usage in Ghana (1988–2030)

Source: Authors' own.

Table 1. SNN Estimates of the Prediction of Contraception Usage

	Beta Coefficient		Coefficient of Determination	
Method	Nigeria	Ghana	Nigeria	Ghana
AM	0.0057	0.0103	0.99	0.86
AMM	0.0036	0.0075	0.96	0.87
Pill	0.000798	0.0018	0.99	0.91
IUD	0.000424	0.000386	0.95	0.01
Injectables	0.000949	0.0013	0.97	0.99
Male condom	0.00081	0.0011	0.96	0.89
Female sterilization	0.000147	0.000604	0.82	0.96
LAM	0.000478	0.000094	0.62	0.95
ATM	0.0024	0.0041	0.91	0.95
Rhythm*	0.0011	—	0.89	—
Withdrawal	0.000903	0.000759	0.91	0.62
Folk method*	0.000414	—	0.82	—
Periodic abstinence**	—	0.0033	—	0.92
Other**	—	0.000283	—	0.64
NCU	0.0442	0.0398	0.98	0.86

Source: Authors' analyses.

Note: * indicates data for 'Rhythm' and 'Folk method' not available for Ghana, while ** indicates data for 'Periodic abstinence' and 'Other' not available.

while it was 10.5 per cent in Ghana. The breakdown of AMM shows that in Nigeria, 1.6 per cent of the women had used pills, 0.8 per cent had used IUD, 1.9 per cent had used injectables, 1.6 per cent had used male condoms, 0.3 per cent had used female sterilization and 1.0 per cent had used LAM. Similarly in Ghana, the breakdown of AMM showed that 3.6 per cent had used pills, 0.8 per cent had used IUD, 2.5 per cent had used injectables, 2.2 per cent had used male condoms, 1.2 per cent had used female sterilization and 0.2 per cent had used LAM. The mean per cent of women using the traditional method in Nigeria was 4.7 per cent, in contrast to 8.7 per cent in Ghana. For Nigeria, this result shows that 2.1 per cent had used the rhythm method, 1.8 per cent had used the withdrawal method, while 0.8 had used the folk method, whereas in Ghana, 1.5 per cent had used the withdrawal method, 6.6 per cent had used the method of periodic abstinence, while 0.6 per cent had used other traditional methods. In the case of those women who had never used any contraception, 88.1 per cent of them were in Nigeria, while 80.8 per cent were in Ghana.

Also, the rate of usage of each method of contraception showed that in the case of Nigeria, AM was 4.1 per cent, AMM was 4.3 per cent, while ATM was 0.6 per cent. Specifically for the modern method, the rate of usage of pills was 1.8 per cent, that of IUD was 1.5 per cent, injectables was 6.9 per cent, male condoms was 7.8 per cent, female sterilization was 0.4 per cent and LAM was 9.6 per cent. Likewise for the traditional method, the rate of usage of rhythm method was 0.2 per cent, that of withdrawal method was 1.1 per cent and folk method was 0.7 per cent. For Ghana, a rate of 4.7 per cent was obtained for AM, 5.9 per cent for AMM and −0.3 per cent for ATM. Specifically for the modern method, the rate of

Table 2. Estimates of Usage and Rate of Usage of Contraception (in %)

Method	Mean Usage (%)		Standard Error of Usage (%)		Rate of Usage (%)	
	Nigeria	Ghana	Nigeria	Ghana	Nigeria	Ghana
AM	11.9	19.2	0.8	1.2	4.1	4.7
AMM	7.2	10.5	0.9	1.5	4.3	5.9
Pill	1.6	3.6	0.4	2.0	1.8	7.8
IUD	0.8	0.8	0.3	1.1	1.5	4.5
Injectables	1.9	2.5	1.4	5.7	6.9	22.6
Male condom	1.6	2.2	1.6	5.5	7.8	22.0
Female sterilization	0.3	1.2	0.1	1.1	0.4	4.5
LAM	1.0	0.2	2.0	1.2	9.6	4.7
ATM	4.7	8.7	0.1	−0.1	0.6	−0.3
Rhythm*	2.1	—	0.0	—	0.2	—
Withdrawal	1.8	1.5	0.2	0.1	1.1	0.5
Folk method*	0.8	—	0.2	—	0.7	—
Periodic abstinence**	—	6.6	—	−0.3	—	−1.2
Other**	—	0.6	—	0.0	—	0.1
NCU	88.1	80.8	−0.1	−0.3	−0.4	−1.0

Source: Authors' analyses.
Note: * indicates data for 'Rhythm' and 'Folk method' not available for Ghana, while ** indicates data for 'Periodic abstinence' and 'Other' not available.

usage of pills was 7.8 per cent, that of IUD was 4.5 per cent, injectables was 22.6 per cent, male condoms was 22.0 per cent, female sterilization was 4.5 per cent and LAM was 4.7 per cent. Likewise for the traditional method, the rate of usage of withdrawal method was 0.5 per cent, that of the method of periodic abstinence was −1.2 per cent, while other traditional methods were 0.1 per cent.

Table 3 shows the forecasted results of contraception usage in the two countries till 2030. The mean per cent of women in Nigeria that would be using AM of contraception will be 16.0 per cent. Those that would be using modern method will be 10.6 per cent, while those that would be using traditional methods will be 5.4 per cent. For the modern method, 1.7 per cent will be using pills, 1.1 per cent will be using IUD, 3.3 per cent will be using injectables, 2.6 per cent will be using male condoms, 0.4 per cent will be using female sterilization and 1.5 per cent will be using LAM. In the case of the traditional method, 2.2 per cent will be using rhythm method, 2.4 per cent will be using withdrawal method, while 0.8 per cent will be using folk method. In the case of Ghana, the mean per cent of women that will be using AM of contraception will be 25.2 per cent. Those that will be using modern method will be 18.8 per cent, while those that will be using traditional method will be 6.4 per cent. For the modern method, 1.5 per cent will be using pills, 0.1 per cent will be using IUD, 14.0 per cent will be using injectables, 2.8 per cent will be using male condom, 0.5 per cent will be using female sterilization and 0.0 per cent will be using LAM. In the case of the traditional method, 0.9 per cent will be using the withdrawal method, 4.8 per cent will be using the method of periodic abstinence, while 0.7 per cent will be using other traditional method.

Table 3. Forecasts of Usage and Rate of Usage of Contraception till 2030 (in %)

Method	Mean of Forecast (%)		Standard Error of Forecast (%)		Rate of Forecast (%)	
	Nigeria	Ghana	Nigeria	Ghana	Nigeria	Ghana
AM	16.0	25.2	1.0	2.1	3.8	3.4
AMM	10.6	18.8	0.7	1.4	4.0	4.2
Pill	1.7	1.5	0.0	0.0	1.6	5.8
IUD	1.1	0.1	0.0	0.0	1.6	0.2
Injectables	3.3	14.0	0.3	1.2	6.1	19.1
Male condom	2.6	2.8	0.3	0.2	6.6	12.3
Female sterilization	0.4	0.5	0.0	0.3	1.2	4.9
LAM	1.5	0.0	0.2	0.0	7.4	−49.1
ATM	5.4	6.4	0.1	0.2	0.6	−1.8
Rhythm*	2.2	—	0.0	—	0.2	—
Withdrawal	2.4	0.9	0.0	0.1	1.1	−2.9
Folk method*	0.8	—	0.0	—	0.9	—
Periodic abstinence**	—	4.8	—	0.2	—	−2.0
Other**	—	0.7	—	0.0	—	1.0
NCU	84.0	74.8	0.7	1.1	−0.4	−0.8

Source: Authors' analyses.
Note: * indicates data for 'Rhythm' and 'Folk method' not available for Ghana, while ** indicates data for 'Periodic abstinence' and 'Other' not available.

By 2030, the rate of usage of each method of contraception showed that in the case of Nigeria, AM will be 3.8 per cent, AMM will be 4.0 per cent, while ATM will be 0.6 per cent. Specifically for the modern method, the rate of usage of pills will be 1.6 per cent, and that of IUD will be 1.6 per cent, injectables will be 6.1 per cent, male condom will be 6.6 per cent, female sterilization will be 1.2 per cent and LAM will 7.4 per cent. Likewise for the traditional method, the rate of usage of rhythm method will be 0.2 per cent, that of withdrawal method will be 1.1 per cent and folk method was 0.9 per cent. For Ghana, a rate of 3.4 per cent will be obtained for AM, 4.2 per cent for AMM and −1.8 per cent for ATM. Specifically for the modern method, the rate of usage of pills will be 5.8 per cent, that of IUD will be 0.2 per cent, injectables will be 19.1 per cent, male condom will be 12.3 per cent, female sterilization will be 4.9 per cent and LAM will be −49.1 per cent. Likewise for the traditional method, the rate of usage of withdrawal method will be −2.9 per cent, that of the method of periodic abstinence will be −2.0 per cent, while other traditional methods will be 1.0 per cent.

Conclusion

In this study, we examined and forecasted trends in the usage of contraception by women in the reproductive age in both Nigeria and Ghana using DHS data for both countries. We used the cubic spline interpolation technique to estimate values between intervals in the census of both countries. Also, trends

in usage of contraception in the two countries were analysed using the time-series SNN model. The results show that though contraception usage is not increasing in both countries as expected, more preference is seen in the usage of modern methods in comparison with traditional methods. A close look at the results further shows that not much difference is noticed between the two main methods (modern and traditional). Nevertheless, results show that the use of contraception in both countries is on the increase with an average growth rate of 4.4 per cent. It can also be seen that desire not to use is on the decline at an average slow rate of 0.7 per cent, while the use of modern contraception is on the increase at an average rate of 5.1 per cent. The analysis also shows that the use of traditional contraception is still in force in Nigeria at a slow increased rate of 0.6 per cent but declining in Ghana at a rate of 0.3 per cent. By 2030, injectables would be mostly used, while withdrawal method will be preferred among those still in favour of the traditional method. Despite the wide knowledge of contraception in Nigeria and Ghana, quite a few people practise it. Little wonder then why the population is increasing every year with no evidence of improvement in basic amenities, as well as structural development for the future. Contraceptives should be made easily available to all in order to reduce maternal mortality. Government can collaborate with private corporations to subsidize the cost and more sensitization on the need to use and benefits of using demystifying all myths and wrong beliefs associated with the use. Religious leaders can also be involved in the campaigns.

Despite the shortcomings experienced by both countries in encouraging the women in the reproductive age to use contraception, these trends show the readiness of African countries, represented by the two countries in this study, to embrace the use of modern contraception in an effort to promote the campaign for Planned Parenthood and Family Programme.

Declaration of Conflicting Interests

Funding

References

Ameh, N., & Sule, S. T. (2007). Contraceptive choices among women in Zaria, Nigeria. *Nigeria Journal of Clinical Practice, 10*(3), 205–207.

Awusi, V. O. (2012). Contraceptive choice among women in Warri, Nigeria. *International Journal of Life Science and Pharma Research, 2*(2), 35–39.

Cheng, B., & Titterington, D. M. (1994). Neural networks: A review from a statistical perspective. *Statistical Science 9*(1), 2–54.

David, O. (2008). Socio-cultural and norms factors influencing family planning choices among couples in Ibadan Metropolis, Nigeria. *European Journal of Scientific Research, 23*(2), 212–218.

Emuveyan, E. E., & Dixon, R. A. (1995). Family planning clinics in Lagos, Nigeria. Clients, methods, acceptance and continuity rates. *Nigerian Medical Journal, 28*, 19–23.

Ibrahim, M. T., & Sadiq, A. U. (1999). Knowledge, attitude, practices and beliefs about family planning among women attending primary health care clinics in Sokoto, Nigeria. *Nigerian Medical Journal, 8*(4), 154–158.

Kabir, M., Iliyasu, Z., Abubakar, I. S., & Maje, B. S. (2003). The role of men in contraceptive decision making in Fanshekara village, Northern Nigeria. *Tropical Journal of Obstetrics and Gynaecology, 20*(1), 24–27.

Lauro, D. (2011). Abortion and contraceptive use in Sub-Saharan Africa: How women plan their family. *African Journal of Reproductive Health, 15*(1), 13–23.

Marston, C., & Cleland, J. (2003). Relationships between contraception and abortion: A review of evidence. *International Family Planning Perspectives, 29*(1), 6–13.

Michael, A. K., & Kelson, K. S. (2014). Determinant factors of current contraceptive usage in Ghana: The study of Adentan municipality in Greater Accra Region. *Peak Journal of Public Health and Management, 2*(3), 53–58.

Noujah, S., & Kalhori, S. R. N. (2014). Artificial neural networks application to predict type of pregnancy in women equal or greater than 35 years of age. *International Journal of Computer and Information Technology, 3*(1), 177–182.

Pacque-Margolis, S., Cox, C., Puckett, A., & Schaefer, L. (2013). *Exploring contraceptive use differentials in Sub-Saharan African through health workforce lens*. CapacityPlus IntraHealth International Inc. Retrieved from http://www.intrahealth.org/files/media/exploring-contraceptive-use-differentials-in-sub-saharan-africa-through-a-health-workforce-lens1/contraceptive-use-workforce-lens.pdf

Ripley, B. D. (1993). Statistical aspects of neural networks. In O. E. Barndorff-Nielsen, J. L. Jensen & W. S. Kendall (Eds.), *Networks and chaos-statistical and probabilistic aspects* (pp. 40–123). London, UK: Chapman and Hall.

Sajid, M. R., Maqsood, F., & Rani, M. (2011). Determinants of fertility: A neural network approach. *Middle-East Journal of Scientific Research, 8*(2), 440–449.

Sharda, R. (1994). Neural networks for the MS/OR analyst: An application bibliography. *Interfaces, 24*(2), 116–130.

Virtalaab, A., Kunttuc, K., Huttunend, T., & Virjoe, I. (2006). Sexual intercourse and current contraceptive use among university students in Finland. *European Journal of Obstetrics & Gynecology and Reproductive Biology, 135*(1), 104–110.

Westoff, C. F. (2005). *Recent trends in abortion and contraception in 12 countries* (DHS Analytical Studies No. 8). Calverton, MD: ORC.

White, H. (1989). Learning in artificial neural networks: A statistical perspective. *Neural Computation, 1*(4), 425–464.

WHO. (2011). *Health topics: Family planning*. Retrieved from http://www.who.int/topics/family_planning/en/

Widrow, B., Rumelhart, D. E., & Lehr, M. A. (1994). Neural networks: Applications in industry, business and science. *Communications of the ACM, 37*(3), 93–105.

Zhang, G., Patuwo, B. E., & Hu, M. Y. (1998). Forecasting with artificial neural networks: The state of the art. *International Journal of Forecasting, 14*(1), 35–62.