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DEVELOPING ALTERNATIVE METHOD FOR ESTIMATING NIGERIA'S POPULATION

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Abstract

The need to develop alternative methods for population estimation has increasingly become necessary in the absence of regular censuses. Population data collected through census often becomes out-dated in Nigeria before another census is conducted. Most population data derived from the indirect sources tend to be less reliable because of various problems facing the sources. The poor quality of the population data is perhaps the cause of the rise in unemployment and poverty rates. This study therefore is an attempt to develop model for population estimation. Both primary and secondary data were used. About 411 household heads were administered with copies of questionnaire in Kabba using systematic sampling technique. The first sample was randomly selected from the first 14 houses in the first street, while subsequent ones taken at interval of fourteenth houses. Descriptive and inferential statistics were employed. The mean of people per house, referred to as crowding index was determined. Correlation was used to determine the degree of association between the population and symptomatic data, while Gini coefficient was employed to determine the best population data employed to develop model. The population of Nigeria was estimated at 179,257,239 with the model. The study thus recommended that the model can be used to estimate population.

Keywords: Development; Model; Indirect; Population; Estimation

Introduction

Developing an appropriate, accurate and reliable indirect technique for population estimation has increasingly become necessary in the absence of regular censuses in Nigeria (Ekanem 1972; Ayeni, 1980; Olorunfemi, 1980, 1983 and 2005; Akanbi, 2006; Bamgbose, 2009; Fashagba, 2014; Fashagba et al, 2014). Since the amalgamation of the Northern and Southern protectorates of Nigeria till 2006 when the country undertook the present census, head count has been infrequently conducted despite its importance for development planning (Okwojo, 1968; Population Association of Nigeria, 1990, Makama, 2007; and Odimegwu, 2013). Today, after a decade, there has not been another census.

The indirect techniques of population data generation that would have been an alternative source have often faced a number limitation. For instance, the population data derived the birth and death sources covered about 48% of the rural areas in Nigeria (NPC, 2014 and Ayeni, 1980). Thus, data estimated from these sources are not likely to be reliable. Other population data derived from demographic surveys have often shown substantial disparity when compared with previous censuses. The poor quality of population data for planning has continued to manifest in form of inadequate infrastructural facilities and social amenities. There has been a consistence rise in unemployment and poverty rates. This study therefore is an attempt to develop model that can be used to estimate population data for development purposes in Nigeria.

Review of Relevant Literature

The word symptomatic is derived from the word symptom which means a sign shown as a defect for something that is lacking. According to Longman Dictionary of Contemporary English, Symptom is a

sign indicating that something or someone has a particular illness. Symptomatic on the other hand means the presence of a particular problem caused by insufficient quantity or quality of something. In this study, symptomatic data are referred to as socio-economic data such as immunization data, school enrolment data, Electricity Meter installation data, Tax identification number and Bank verification data, among others, that can indicate the direction of growth in population. These data could be used to develop model(s) to generate population data for planning purposes in the absent of regular census which is the primary source of population data. Immunization and primary school enrolment data therefore would be reviewed to determine the feasibility of using the two data for population estimation in this study.

Some of these data have been used by few scholars to estimate population of various parts of Nigeria. Akanbi (2006) evolved model from school enrolment data. In his study carried out in 2006, he used data of primary school enrolment and National Population Commission (NPC) to develop model for population estimation. While determining the relationship between population and primary school enrolment in the study, he observed that the LGAs' population data strongly and positively correlated with the primary school enrolment data. Thereafter, he estimated the population of Kwara State by substituting the 1993–2001 primary school enrolment data for 9 Local Government Areas in Kwara State. Although there were slight variations among the population of some local governments, the estimated populations were comparable to the NPC projected populations. This possibly suggests that school enrolment records can be a good source of data for population estimation.

Although immunization data has not been used, the data are likely to be good for population estimation because it was meant to reduce the high mortality rate among the infant and children when immunized against the six deadly diseases of Tuberculosis, Poliomyelitis, Diphtheria, Whooping Cough, Tetanus, Measles and Hepatitis (Hahya, 2006; National Programme on Immunization, 2005). Immunization programme has not only had good coverage in Nigeria, but has continued to expand since it was introduced in 1979. Bacilli Calmette Guerin (BCG) is one of the six vaccines that had often had the highest coverage in Nigeria. Consequence upon this, the BCG immunization and primary school enrolment data were employed to determine the feasibility of developing model which subsequently was used for population estimation.

Study Area

This study was carried out in Kabba, the Kabba/Bunu Local Government headquarters. The local government is located on Latitudes of 70 45′ and 80 28′ North of Equator and Longitudes of 60 5′ and 60 30′ East of Greenwish Meridian. Kabba/Bunu Local Government is bounded by Yagba West, Mopamuro and some parts of Ijumu Local Government Area to the west, Okehi Local Government areas to the South, Lokoja Local Government Area to the East, Kogi Local Government Area and Kwara State to the North (Figures 1 and 2).

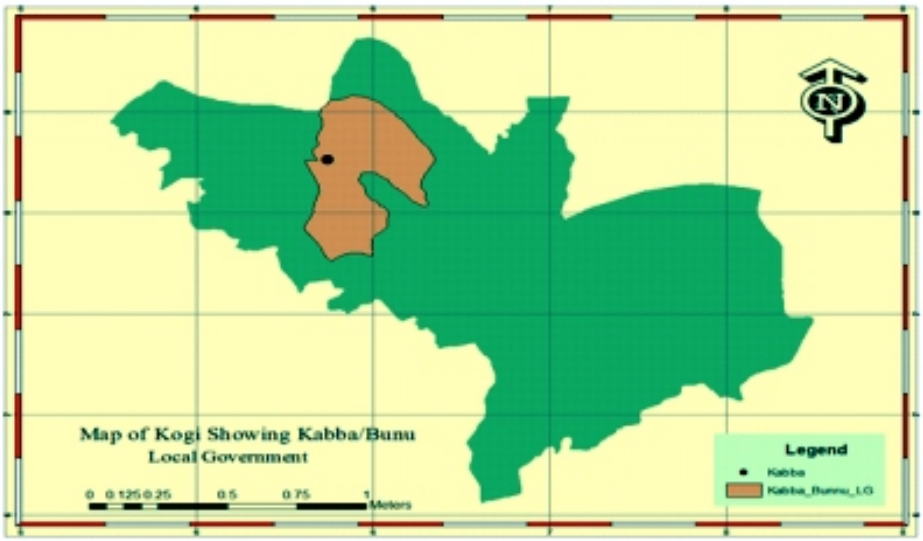

Figure 1: Map of Kogi State showing Kabba/Bunu Local Government Area
Source: Kogi State Lands and Survey, 2014.

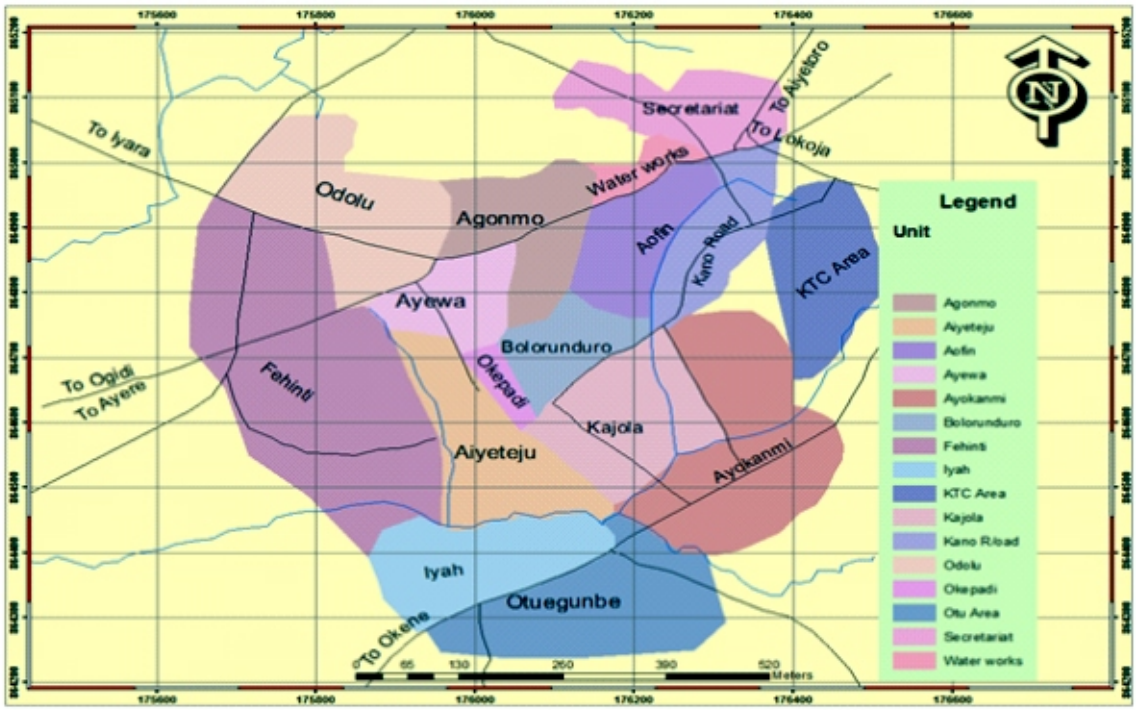

Figure 2: Map of Kabba Town Showing the Sixteen Quarters in the Study area

Source: Kogi State Lands and Survey, 2014.

Kabba is the main town among the 29 settlements which make up Oweland in the LG. Majority of the Owe people live in Kabba, being the primate town in the Local Government. A sizeable number of people from settlements around the town had migrated to Kabba. As a result of this, the town has submerged some of the settlements at its suburbs.

There are three political districts Kabba-Kabba, Odolu and Aofin; and seven political wards-Aiyetuju/Kakola, Odolu/Fehinti, Ayewa, Asuta, Oke-koko, Bolorunduro and Otugunge. The town is situated at about 78km from Lokoja, the State Capital of Kogi and about 130km from Abuja, the Federal Capital Territory of Nigeria.

Materials and Methods

Data on BCG immunization and that of all the houses in Kabba generated through direct house counting were employed to develop model for population estimation in this study. The demographic data of the people was collected through 411 copies of questionnaire administered on 4,012 household heads in Kabba. This sufficiently covered the 10% often recommended for demographic survey (Oludoyi, 2007 and Oriola, 2002). Using systematic sampling technique, the first sample was randomly selected from every first house selected in each street of every quarter, while subsequent samples were selected at the interval fourteenth house until the last sample was secured. In some cases, where the selected houses had more than one household, the first household head seen was sampled. Also, in some instances where the household heads could not be reached in the selected houses, the adjacent houses were taken in replacement.

Frequency distribution and simple percentage were used to summarize the demographic characteristic, household and housing data collected from the respondents. The mean ($\bar{x}$) otherwise referred to as the crowding index in this study, Standard Deviation (SD), and Variance (V) were also calculated.

Product Moment Correlation Coefficient was used to determine the degree of association between population (dependent variable) immunization and Primary School Enrolment (independent variables). To do this, the population of all the quarters was regressed against immunization and primary school enrolment data.

Linear and Multiple regression analytical techniques were employed to estimate the population. The Linear regression formula for the study is:

$$\bar{Y} = a + bx \qquad (i)$$

Where

Y = the population of Kabba obtained from average number of people per house;

x = BCG Immunization coverage of Kabba.

a = intercept; and

b = slope of regression.

The multiple regression formula adopted for this study is in the form:

$$\bar{Y} = a + b_1x_1 + b_2x_2 + b_3x_3 + \ldots + b_nx_n + e \quad (ii)$$

Where

Y= the population of Kabba obtained from an average number of people per house;

x_1 = BCG Immunization coverage of Kabba;

x_2 = Primary school enrolment of Kabba;

a = intercept;

b = slope of regression; and

e = error term.

Gini-coefficient of determination was employed to determine the differences among all the population estimates. The Gini coefficient closest to zero among all the Gini indexes was adjudged the best. The Gini formula is of the form:

$$G = 2\frac{\sum i-1iyi}{n\sum i-1yi} - \frac{n-1}{n} \qquad (iii)$$

Where

y= Population of the 16 quarters;

1yi = the total number of people estimated in the quarters

I = the total number of people estimated for each quarter; and

n = number of quarters (16)

Results and Discussion

Table 1 shows the three population estimates derived by multiplying the crowding index of all the quarters, wards and Kabba by the total number of houses in various quarters, wards and the town in general, respectively. Using the crowding index for quarter, the first population of the town was put at 70,870, while the crowding index of the wards and Kabba indicated the populations as 71,575 and 70,990, respectively.

Table 1: Population Estimates using Crowding Index

S/no	Source of Crowding index	Population estimate
1	CI per quarter	70,870
2	CI per ward	71,575
3	CI of Kabba	70,990

Source: Author fieldwork, 2014

The three population estimates derived from the crowding index differ. Hence, the relationship between various population estimates and symptomatic data were determined.

Relationship between Population, Immunization and Primary School Enrolment Data

The population data derived from the crowding index of Kabba was regressed against immunization and primary school enrolment data. When the population data was regressed against immunization and primary school enrolment data, population strongly and positively correlates with immunization (0.840), while it fairly and positively correlates with primary school enrolment (0.637). The regression has a coefficient of 0.71. Further, the association between population and each of the independent variables was determined. When population was regressed against immunization, it indicates a correlation of 0.840 and coefficient of determination of 0.70. When the primary school enrolment data was regressed against population, it indicates a fair and positive correlation, but with a lower co-efficient of determination of 0.40. This suggests that immunization data is best and can be used to develop model. Notwithstanding, two models were developed; the first model

$$Y = 748.865 + 30.014x_1 \quad (iv)$$

was developed with immunization data alone, while second model

$$Y = 719.746 + 465x_1 + 0.14x_2 \qquad (v).$$

was developed using immunization and primary school enrolment data.

Using the models, the first population of Kabba was estimated at 70,870, while the second put the population at 70,866. These two population estimates derived from models together with the other three derived from crowding index were tested with Gini coefficient of determination to select the best data and model that could be used for population.

Selection of Model for Population Estimation

Table 3 shows the results of the Gini coefficient of determination carried out on all the five population estimates of Kabba.

Table 2: Summary all the Population Estimates of Kabba and the Gini Coefficient Test

S/No	Source of estimate	Estimate	Gini index	Coeff. Of determ.
1	C I for Kabba	71,575	0.18	18
2	C I per Quarter	70,870	0.13	13
3	C I per Ward	70,990	0.18	18
4	Immunization	70,870	0.13	13
5	Imm. and Pri. Sch Enrol.	70,866	0.14	14

Source: Author's Computation, 2014

The table shows that the Gini index of the population derived from immunization data is closest to zero among all the population estimates. This thus suggests that immunization data alone can be used to evolve model for population estimation. In view of this, the model developed with immunization data was adopted and used to estimate the country's population.

Population Estimate of Nigeria

To estimate Nigeria's population, BCG immunization data for the 36 States and Abuja, the Federal Capital Territory was substituted in the model. Thus, Nigeria's population was estimated as 179,257,239 (Table 3). Among all the 36 States, Kano State has the highest estimated population of 11,999,356, while Lagos State followed with a total population of 11,632,494. Bayelsa State, on the other hand, has the lowest estimated population of 2,176,164 among all the States in Nigeria.

Conclusion and Recommendations

Attempt has been made to develop model using the crowding index of Kabba, the total number of houses in the town and the immunization data. The population estimates of Kabba were 70,780, 70,990 and 71,575 using the crowding index of the quarter, ward and Kabba in general. All the population estimates derived from the crowding index have strong relationship. However, immunization data was best by indicating the lowest Gini index of 0.13. Using immunization data, the population estimate of Nigeria is 179,257,235. Among the 36 States, Kano State has the highest population of 11,999,356, while Lagos State followed with a total population of 11,632,494. Bayelsa State has the lowest estimated population of 2,176,164.

Based on the estimated population of Nigeria using the model developed with immunization data, this technique is suggested for population estimation in the absence of regular census in Nigeria. Indeed, the model can be used to generate all the necessary population data needed for social, economic, political and spatial development planning in Nigeria. Finally, the model can be employed to estimate population of other developing countries that are facing problem of population data generation.

Table 3: Population Estimate for Nigeria

S/No	*State*	*Population Estimate*
1	Abia	3,632,233
2	Adamawa	4,057,951
3	AkwaIbom	4,980,822
4	Anabra	5,332,796
5	Bauchi	5,939,319
6	Bayelsa	2,176,164
7	Benue	5,429,561
8	Borno	5,324,212
9	Cross River	3,692,981
10	Delta	5,249,357
11	Ebonyi	2,779,115
12	Edo	4,127,404
13	Ekiti	3,062,477
14	Enugu	4,171,404
15	Gombe	3,019,197
16	Imo	5,013,387
17	Jigawa	5,566,575
18	Kaduna	7,803,248
19	Kano	11,999,356
20	Katsina	7,405,143
21	Kebbi	4,156,998
22	Kogi	4,230,382
23	Kwara	3,019,587
24	Lagos	11,632,494
25	Nassarawa	2,386,592
26	Niger	5,048,113
27	Ogun	4,788,222
28	Ondo	4,417,759
29	Osun	4,361,723
30	Oyo	7,123,491
31	Plateau	4,093,158
32	Rivers	6,635,734
33	Sokoto	4,726,363
34	Taraba	2,929,545
35	Yobe	2,963,401
36	Zamfara	4,185,481
37	FCT Abuja	1,795,496
	Nigeria	179,257,239

Source: Author's Computation, 2014

References

Ayeni, O. O. (1980). A Vital Registration Model for Nigeria Population: Data Assessment from the Nigeria Proceeding. No 1, Population association of Nigeria.

Akanbi, O. A. (2006). The Use of Symptomatic Data for Population Estimation: A Case Study of Kwara State, Geo-Studies Forum, 3(1&2):128-134.

Aluko, S. A. (1965). How Many are Nigerians? An Analysis of Nigeria's Census Problems (1901-1963): Journal of Modern African Studies, 3 (3): 371-392.

Bamgbose, J. A. (2009). Falsification of Population Census Data in Heterogeneous Nigerian State: The Fourth Republic Example: African Journal of Political Science and International Relation, 3(8):311-319

Ekanem, I. I. (1972). The 1963 Nigerian Census: A Critical Appraisal, Benin City, Ethiope Publishing Corporation.

Eniayejuni, A. T. and Agoyi, M. (2011).A Biometric Approach to Population Census and National Identification in Nigeria: A Prerequisite for Planning and Development: Asian Transaction on Basic and Applied Sciences, 1(5):51-57.

Fashagba, I., Adeoye, A. O., Babalola, J. B. and Kuranga, J. I. (2014). Modelling of population Projection and Symptomatic Estimated Population in Nigeria. 2(1):5-10.

Fashagba, I. (2014). Nigeria Population Growth Pattern (2003-2011): An Indirect Population Estimate Approach. Contemporary Journal of Social Sciences, 4(2):48-61.

Kogi State Lands and Survey (2014). Kogi State Town and Urban planning Office, Lokoja.

Makama, S. D. (2007). Report of Nigeria's National Population on the 2006 Census, Population and Development Review, 33(1):206-210.

National Population Commission, (2010). Population Distribution by Age and Sex. Federal Republic of Nigeria 2006 Population and Housing Census Priority Table Volume 6.

Ojo. E. O. (2000). Explaining Nigeria Politic. Geo-Studies Forum: An International Journal of Environmental and Policy Issues,1(172):96-105.

Odimegwu, F. (2013). Federal Government and a Credible Census. Editorial Comment, the Nigerian Tribune, September,3rd p.19.

Okonjo, C. (1968). A Preliminary Estimate of the 1962 Mid-Year Population of Nigeria. In Caldwell, J. C. and C. Okwonjo, (eds). The Population of the Tropical Africa, p.78.

Olorunfemi, J. F. (1982).Application of Aerial Photography to Population in Nigeria. Geo Journal, 6 (3): 225-230. Accessed at link. Springer coin/article/10./007%2..on 8th November, 2014.

Olorunfemi, J. F. (1981). Crowding Index: An Alternative to Census in Nigeria Area, 13 (1):51-54.

Olorunfemi, J. F. (2006). Enhancing Accurate Population Census for Productivity: Science and Humanities Journal, 1(1):112-129.

Oludoyi, S. B. (2007). Data Collection. In: Saliu, H. A.and J. O. Fayeye, (eds) Further Readings in Research Methodology, Faculty of Business and Social Sciences, University of Ilorin, Ilorin Publication

Onyekakeyah, L. (2011). The Historic Fraud on Nigeria's Population. "The Guardian" Tuesday, March, 2011.

Oriola, E. O. (2002). The Methodology in Social Sciences, Leading Issues in General Studies: Humanities and Social Sciences. The General Studies Division, University of Ilorin Publication.

Orubuloye, I.O. (1983). Demographic Situation. In: Population and Development in Nigeria, Nigerian Institute of Social and Economic Research (NISER), Ibadan, pp.7-16

Population Association of Nigeria (1990). Everybody's Guide to Nigerian Census. The Population Association of Nigeria.

Yahya, M. (2006). Polio Vaccines- Difficult to Swallow: The Story of a Controversy in Northern Nigeria. Institute of Development Study IDS Working Paper 261.