Assessment of the completeness of births and deaths registration in an urban Nigerian community

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Abstract

This paper assessed the completeness of births and deaths registration in Mokola, a semi-urban community in Oyo state, Nigeria. The cross-sectional study with a two-stage cluster sampling was designed to select 1361 men and women aged 15 to 65 years. Information on births and deaths registration was collected using a structured pretested interviewer administered questionnaire. Assessment of birth and death registration data was carried out using indirect demographic methods. The mean age of respondents was 31 years (SD ± 8.8 years). Almost all mothers (91.1%) claimed they registered the index births and 36.5% of mothers were able to produce birth certificates. For deaths, completeness of registration in Mokola was very low with an estimate of completeness at 21% for the period 2000 to 2006. The study concluded that birth and death registrations were largely incomplete in the study area.

Keywords: Births and deaths registration, completeness, indirect demographic methods, Nigeria

Résumé

Ce document évaluait l'exhaustivité des naissances et décès inscription dans Mokola , une communauté semi- urbaine dans l'Etat d'Oyo , au Nigeria. L' étude transversale auprès d'un échantillon de grappes à deux degrés a été conçu pour sélectionner 1 361 hommes et femmes âgés de 15 à 65 ans. Informations sur les naissances et les décès enregistrement a été recueillie à l'aide d'un pré-test interviewer questionnaire administré structuré. Évaluation de la naissance et de données d'enregistrement des décès a été réalisée en utilisant des méthodes démographiques indirectes. L'âge moyen des répondants était de 31 ans (SD ± 8,8 ans). Presque toutes les mères (91,1%) ont affirmé qu'ils ont enregistré les naissances de l'indice et 36,5 % des mères étaient capables de produire des certificats de naissance. En cas de décès , l'exhaustivité de l'enregistrement dans Mokola était très faible avec une estimation de l'exhaustivité à 21 % pour la période 2000 à 2006. L'étude a conclu que la naissance et la mort inscriptions étaient largement incomplètes dans la zone d'étude.

Mots-clés: naissances et l'enregistrement des décès, l'exhaustivité , les méthodes démographiques indirectes , Nigeria

Introduction

For adequate planning at the national and regional levels, a nation requires detailed information about the demographic characteristics of her population. In their quest for social and economic development, developing countries often struggle with information that is incomplete or is not available at the time it is needed. Nigeria's vital registration of births is about 30% complete with 21.2% and 50.3% in rural and urban areas respectively (UNICEF, 2007, pp. 1-2), one of the lowest in Africa. This indicates a violation of the child's inalienable human right to be given an identity at birth and to be regarded as part of society. In 2001, the Country's assessment paper of UNICEF (2002) and National Population Commission [NPopC] (2002) had put Nigeria's total coverage of registration of births at 28.2% as against 78.6% in the Cameroon, 61.7% in the Republic of Benin and Togo 81.2% (UNICEF, 2002). A slight increase of about 2% from 28.2% in 2001 to 30.2% in 2006 is observed over a period of 5 years in the registration of births in Nigeria (UNICEF, 2007). Generally, these estimates show that a gross proportion of births in the country are not registered. In addition, these studies have focused more on estimating the completeness of births registration with very little attention on the completeness of deaths registration. Consequently, this has led to a dearth of information on the completeness of death registration at the state and national level.

Literature review and theoretical framework

Low completeness of vital registration is most prevalent in developing countries with inaccurate or missing data. Many countries still do not have a functional vital registration system that provides information on

the required quality or completeness for calculating reliable demographic indices (UNICEF, 2007, p. 2). In some cases, however, an evaluation of the existing data will suggest that they are adequate if certain adjustments are made. In other cases, no vital registration data exists at all, or the available data are too sparse even for adjustment (NPopC, 2010, p. 6). This is largely due to ignorance, reluctance to register events, cultural values, structure of the system, births at home, in accessible areas, or into a population that is set apart from mainstream society because of its ethnicity, poverty or geographical remoteness e.t.c (NPopC, 2010, p. 6).

The 2008 Nigerian Demographic Health Survey (NDHS), National Bureau of Statistics (1999), and UNICEF (2007) examined the completeness of birth registration in Nigeria and found it to be incomplete. In 1999, the National Bureau of Statistics estimated the percentage of births registered ranged from 10% in the North West to 50% in the South West and South East (NBS, 2005). Furthermore, the country assessment paper of UNICEF has put Nigeria's total coverage of registration of births at 30.2% as at 2006. (UNICEF, 2007). Also, the 2008 NDHS estimated the completeness of birth registration at 30% and, of those, 38% had a birth certificate (NPC and ICF Macro, 2009). These studies have provided in-depth information on the awareness, attitude, and practice of births and death registration.

Few studies in Nigeria have assessed the registration of deaths in Nigeria. For instance, Adekolu – John (1988) examined the vital and health statistics including an assessment of registered deaths from 1977 to 1979 in the Kainji Lake area of Nigeria. The author found that the number of deliveries in the hospitals was more than the number of registered births, and no death was registered at the centers implying a low level of completeness of the existing registration system (Adekolu-John, 1988). Akesode (1980) estimated the completeness of births and deaths in the Old Western Region as 7.7% and 1.7% respectively (Akesode, 1980). Furthermore, Akande and Sekoni (2005) showed that awareness of death registration in Oke-Oyi town in Kwara was very low. Of the 209 households that recorded deaths in the household within the last 10 years only 24 (11.8%) households reported registering deaths in the last 10 years (Akande & Sekoni, 2005). These studies focused on awareness of death registration and utilized cross sectional analysis to estimate the completeness of deaths registration.

Given the major deficiency of the vital registration in developing countries, the indirect approach can be used to estimate the completeness of births and deaths registration as well as mortality estimation (Darikwa & Dorrington, 2011). These indirect techniques depend on models to produce estimates of a certain parameter on the basis of defective or incomplete data. There are several classic techniques that have been used to assess the completeness of births and death registration. Pathak and Ram (1993) assessed the completeness of civil registration in India and its major states from 1981 to 1991 using Brass (1975) and Bennett and Horiuchi (1981) method. The Bennett and Horiuchi method proposes an alternative way of estimating the completeness of death recording relative to census coverage by using two censuses, age specific growth rates for the inter-censal period and a distribution of deaths by age. A decline in the quality of the civil registration system since the 1960s was observed, and about 50% of adult deaths were registered (Pathak & Ram, 1993). Safa Ibrahin (2002) also assessed the completeness of adult death registration in Sudan using the Brass Growth Balance method. The analysis showed that only 4.4% of deaths were registered. The advantage of the Brass Growth Balance Method (1975) over techniques developed by Bennett-Horiuchi (1981) and Preston-Coale (1983) is that it does not require knowledge of the population growth rate (Brass, 1975).

Recognizing the limited evidence on completeness of death registration and inadequate utilization of indirect demographic techniques to estimate the completeness of vital registration in Nigeria, the study assessed the completeness of births and deaths registration in Mokola, Oyo State.

Data and methods

Oyo State is located in the South Western geopolitical zone in Nigeria and has a land size of 28,245 Klm^2. Its population size is estimated at 5,580,894 persons with a population density of 198 and inter-census growth rate at 3.05. (NPopC, 2010). Ibadan, the capital of Oyo State is the third largest metropolitan area, by population, in Nigeria, after Lagos and Kano States with 1,338,659 persons. The data used in this study was drawn from a survey conducted in Mokola area in Ibadan. Mokola is an urban community located in Ibadan North Local Government Area of Ibadan with a population of 17,014 persons. The mean household size is 4 persons per household (NPopC, 2010). The Yoruba ethnic group dominates the community with majority of the residents in private business such as: trading and artisans.

The cross sectional survey, conducted in November 2006, interviewed 1361 individuals with either a birth or death in the last five years prior to study. A two-stage cluster sampling technique was used to select eligible respondents in Mokola area, Ibadan. In the first stage, 30 clusters out of a total of

50 (a cluster was defined as a group of households in a named street) was selected by simple random technique. Afterwards, a household listing of all individuals in each household in the 30 clusters generated after which all women aged 15 – 49 and men aged and 15 - 65 years were selected. A structured questionnaire was used to to collect data about births and deaths in their households. This was collected regardless of marital status and place of residence at the time of the birth or death. The inclusion criteria for participation in the study includes: women aged 15 to 49 years, men aged 15 to 65 years living in Mokola, had a birth or death five years prior to the study and completed an informed consent. The household and individual response rates for the survey are very similar to that of the NDHS 2008 survey. The response rate for men aged 15 -65 years and women aged 15-49 years are 91.7% and 96.5% respectively.

A sample size formula was used to estimate the sample size. Using the proportion of total births registered in the country at 28.2% (NPopC, 2002, p. 10), a design effect of 3.5, a response rate of 90% at a level of precision of 5%, and a minimum sample size of 1205 individuals was obtained. However, a total 1361 individuals were administered the questionnaire to allow for statistical analysis to provide reasonable estimates for sub group analysis.

A structured, pretested interviewer administered questionnaire was used to obtain information from eligible participants. Prior to data collection, trained research assistants did house to house numbering. The survey tool consisted of two sections: the household and individual questionnaire. The content of these questionnaires was similar to the 2008 NDHS questionnaire (NPC and ICF Macro, 2009). The household questionnaire contained questions on demographics of household members while the individual questionnaire contained socio-demographic of the participant, birth and death registration information. The questionnaire contained mostly closed-ended and few open-ended questions. Some specific questions asked for birth includes "Do you have a child's birth certificate?" "Has your child been registered?" "Do you know where the birth was registered? "For deaths, questions include "Age at death of individual", "Do you have the Individual's death certificate?"

The University of Ibadan/ University College Hospital Institutional Review Committee approved this study. Consent for participation in the study was obtained using the informed consent form from the participants before administering the questionnaires. Participants were informed on their right to either take part in the study or decline.

Data management and analysis

Data was entered and analyzed using the SPSS version 16. Descriptive statistics was used for socio-demographic and household characteristics. The Population Analysis Software (US Census of Bureau, 2007) was used for demographic analysis.

Completeness of death reporting

In order to determine the completeness of death reporting, the Brass Growth Balance Method (1975) was chosen over other techniques in estimating the completeness of reporting of deaths. This is as a result of the suitability and availability of the data required in comparison to Bennett-Horiuchi (1981) and Preston-Coale (1983) methods that require two consecutive censuses. This technique estimates the completeness of reporting of deaths for those over the age five years in relation to information on population. It compares the distribution of deaths in relation to the distribution of population, both by age.

Equation 1: Brass growth balance equation

$N(x) / N(x+) = r + K*D(x+)/ N(x+)$

Where:

$N(x)$ is the population at exact age x,

$N(x+)$ is the population above age x

r = growth rate

K = correction factor for death under registration

$D(x+)$ = deaths above age x

$N(x)/N(x+)$ = partial birth rate

$D(x+)/N(x+)$ = partial death rate

Completeness of birth registration

In measuring the completeness of birth registration, the percentage of children less than five years of age whose birth has been registered at the time of the survey was estimated. The numerator of this indicator includes children whose birth certificate was seen by the interviewer *'Sighted by interviewer'* or whose mother or caretaker *'Mother said so'* says the birth has been registered. The method did not attempt to assess the omission of births in the study.

Equation 2: Estimating Birth Registration Completeness for births 0 to 59 months

Birth registration completeness:

$$\frac{\text{Number of children aged 0-59 months whose birth was declared registered}}{\text{Total number of children aged 0-59 months surveyed}}$$

In addition to the above method, the completeness of births registration was estimated using the stable population model. The survey collected information from which a reasonable estimate of l_2, the probability of surviving to age two for females could be estimated. This was then used to select an appropriate

model life table and a set of stable age distributions from the West family of the Coale-Demeny models (1966). The model age distribution whose C(30), the proportion under age 30, was equal to that of the Mokola population was selected. The birth rate of the model age distribution was then assumed for the Mokola population.

Equation 3: Calculating the registered birth rate of the Survey Data

The birth rate of the survey area:

Registered births in the last 12 months in 2005

Total population listed in the households

Equation 4: Estimating the completeness of birth registration

The completeness of birth registration was thus calculated as:

Birth rate calculated from registered births

Birth rate calculated from a matching stable population.

Results

Characteristics of respondents

Table 1 Socio-demographic characteristics of males and females in Mokola, 2006

Characteristics	Male Number	Percentage (%)	Female Number	Percentage (%)
Age (years)				
15-19	38	9.8	70	7.2
20-24	95	24.4	149	15.3
25-29	78	20.1	235	24.2
30-34	32	8.3	180	18.5
35-39	41	10.5	142	14.6
40-44	27	6.9	96	9.9
45-49	36	9.3	98	10.1
50-54	20	5.1	-	-
55-59	15	3.9	-	-
60-64	5	1.3	-	-
Religion				
Christians	321	82.5	770	79.2
Islam	61	15.7	186	19.1
Others	7	1.8	16	1.6
Tribe				
Hausa	6	1.5	19	2.0
Yoruba	261	67.1	693	71.3
Igbo	73	18.8	129	13.3
Others	48	12.3	131	13.5
Education				
Koranic	1	0.3	4	0.4
Primary	16	4.0	101	10.4
Secondary	175	45.0	515	53.0
Tertiary	185	47.6	350	36.1
Occupation				
Management	37	9.5	103	10.6
Student	160	41.1	207	21.3
Employed	162	41.6	573	59.0
Unemployed	22	5.7	75	7.7
Marital status				
Single	225	58.0	267	27.5
Living together	6	1.5	14	1.4
Married	155	39.8	670	69.0
Divorced	1	0.3	3	0.3
Separated	1	0.3	9	0.9
Widowed	-	-	4	0.4

Table 1 shows the distribution of background characteristics of men and women aged 15-64 years and 15-49 years respectively. Among the 387 men studied, the highest proportion was in age group 20-24 years, while among 970 women, the highest proportion was in ages 25-29 years. About half (52%) of males and 70.6% of females were in employment out of which 9.7% of males and 10.8% of females work in professional management. Concerning marital status, 39.9% of all men were currently married compared with 69.3% of the females. About 58% of men were single, the corresponding proportion being 27.6% for females.

Completeness of birth registration

Completeness of birth registration by existence of certificates:

Table 2 shows the possession of birth certificate by children aged 0-59 months. Possession of birth certificate was grouped into 'Mother said so' and 'Sighted by interviewer'. The result shows that more births were registered by the indicator 'Mother said so' than 'Sighted by Interviewer'. For the completeness of birth registration for children aged 0-59

months, a range of estimates of 36.5% to 91.9% was obtained while for births during the last 12 months a range of 34.8% to 84.8% was obtained. The completeness of registration by existence of birth certificates for children aged 0 to 59 months can be calculated from the percentage of certificates sighted by interviewers (145/397) and indicator of birth registration (certificate sighted by interviewer + Mother said so (362/397). Based on the calculation, the lower and upper values of completeness of births registered for children aged 0 to 59 months from 2002 to 2006 ranged from 36.5% to 91.1%. For births during the last 12 months, the certificates sighted by interviewer (23/66) and indicator of birth registration (56/66) was used to calculate the range of lower and upper values from 34.8% to 84.8%.

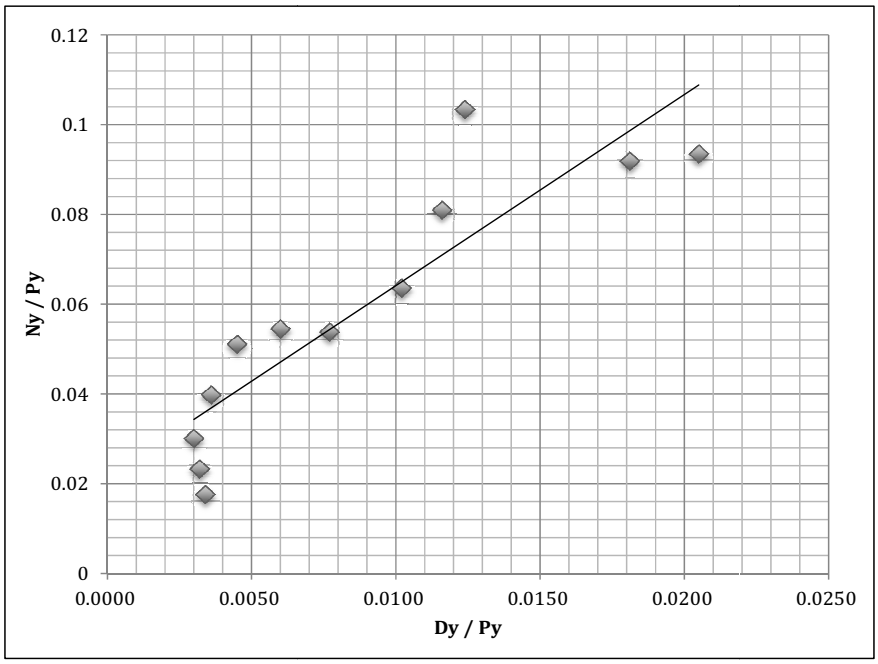
Table 2 Indicator of birth registration by children aged 0 to 4 years in Mokola, 2006

Age at last birthday (In years)	Has child's birth been registered?			No	Don't know
	Indicator of birth registration		All births registered n (%)	n (%)	n (%)
	Mother said so n (%)	Certificate sighted n (%)			
0	33 (50.0)	23 (34.8)	56 (84.8)	9(13.6)	1 (1.5)
1	37 (54.4)	26 (38.2)	63 (92.6)	4 (5.9)	1 (1.5)
2	47 (54.0)	31 (35.6)	78 (89.7)	8 (9.2)	1 (1.1)
3	51 (54.3)	37 (39.4)	88 (93.6)	6 (6.4)	0 (0.0)
4	49 (59.8)	28 (34.1)	77 (93.9)	5 (6.1)	0 (0.0)
Total	217 (54.7)	145 (36.5)	362 (91.1)	32 (8.1)	3 (0.8)
Indicator by existence of certificate					
Birth rate /1000 of the population	5.35	4.56			
Percentage of births registered (%)	16.49	14.06			

Completeness of birth registration using the stable population model:

Table 2 also shows the completeness of registered births in the last 12 months using a stable population model. A birth rate of 32.43 per 1000 of the population was estimated from the stable population model. The probability of surviving to age 2 (l_2) was estimated from the mortality data as 0.9532 and the percentage aged under 30 years old C (30) was estimated at 0.6587. Based on these estimates, level 20 of the Coale-Demeny West model was selected. In calculating the total expected births in the population (as shown in box 1), the birth rate matching the stable age distribution was selected at 32.43 per 1000 and the total expected births estimated was calculated as 206. Births in the last 12 months were used to calculate estimates of birth registration. The lower estimate (mother said so) was calculated as 16.0% and upper estimate calculated as 27.2%.

Figure 1: Completeness of Death Registration using Brass Growth Balance Method in Mokola, 2006



Completeness of death registration for ages 5-65years

The completeness of death registration was estimated for 2006 the year of the survey using Brass Growth Balance method. Table 3 shows the results obtained using the brass growth balance method for both sexes for the year 2006. Figure 1 shows a graph plotted with Dy/Py (column 8) on the x axis and Ny/Py (column 9) on the y axis. The plotted points were used to determine the line of best fit by computing averages of selected points, correction factor, and growth rate. Line shows the means calculated from the observed partial birth and death rate. The completeness of death registration in Mokola is 21.0% with a correction factor of 4.7626 and growth rate of 1.7%.

Table 3 Results on brass growth balance method for both sexes in Mokola, 2006

Age	Deaths	Smoothed population	Exact age	Population at exact age	Population aged Y and over	Reported deaths over age y	Dy / Py	Ny / Py
Y	5Dy	5Ny	Y	Ny	Py	Dy		
0-4	5	464	5	N/A	6,360	25	0.0034	0.0175
5-9	3	570	10	103	5,896	20	0.0032	0.0232
10-14	3	667	15	124	5,326	17	0.0030	0.03
15-19	0	729	20	140	4,659	14	0.0036	0.0397
20-24	0	832	25	156	3,930	14	0.0045	0.051
25-29	0	747	30	158	3,098	14	0.0060	0.0544
30-34	0	531	35	128	2,351	14	0.0077	0.0537
35-39	0	446	40	98	1,820	14	0.0102	0.0635
40-44	3	426	45	87	1,374	14	0.0116	0.0809
45-49	0	341	50	77	948	11	0.0181	0.0918
50-54	3	216	55	56	607	11	0.0205	0.0934
55-59	5	149	60	37	391	8	0.0124	0.1033
60-64	0	101		25	242	3		
65+	3	141		N/A	141	3		
Total	25	6360						

* P value is significant

Socio-demographic characteristics and registration of vital events

Table 4 explores the relationship between births and deaths registration against socio-demographic characteristics. Mothers' education was significantly associated with the registration of births 95% CI (0.106 – 0.893). They were three times less likely to register their births than mothers with secondary and above education. For deaths, occupation ($P<0.05$) and sex of deceased ($P<0.1$) were found to be significantly associated with registration of deaths.

Table 4 Socio-demographic characteristics associated with registration of births and deaths in Mokola, 2006

	Births registered		**Mutlivariate**		**Deaths registered**		**Bi-variate**
Variable	**Yes (%)**	**No (%)**	**OR**	**95% CI**	**Yes (%)**	**No (%)**	**P value**
Sex							
Male	157 (91.8)	14 (8.2)			17 (20.9)	44 (54.3)	0.08*
Female	171 (92.9)	13 (7.1)	0.85	0.38-1.87	14 (18.7)	31 (41.3)	
Marital status							
Never married	18 (85.7)	3 (14.3)	0.57	0.62-10.64	9 (52.9)	8 (47.1)	0.27
Ever married	303 (92.7)	24 (7.3)			16 (37.2)	27 (62.8)	
Education							
< Secondary	48 (82.8)	10 (17.2)	0.31	0.11 -0.90*	17 (37.8)	28 (62.2)	0.13
Secondary & above	270 (94.4)	16 (5.6)			8 (61.5)	5 (38.5)	
Ethnicity							
Yoruba	240 (93.0)	18 (7.0)	1.58	0.59-4.3	15 (40.5)	22 (59.5)	0.82
Others	88 (90.7)	9 (9.3)			10 (43.5)	13 (56.5)	
Occupation							
Employed	56 (87.5)	8 (12.5)	0.22	0.70-4.82	15 (34.9)	28 (65.1))	0.03*
Unemployed	266 (93.3)	19 (6.7)			10 (66.7)	5 (33.3)	
Religion							
Christianity	222 (94.9)	12 (5.1)	1.59	0.57-4.44	22 (47.8)	24 (52.2)	0.15
Islam	97 (89.0)	12 (11.0)			3 (21.4)	11 (78.6)	
Age of mother							
< 35 years	240 (92.7)	19 (7.3)	1.28	0.48-3.46			
35 years and above	88 (91.7)	8 (8.3)					

P value is significant

Discussion

To our knowledge, this is the first study that examines the completeness of births and deaths registration in Mokola. The high proportion of respondents with a form of education reflects a high literacy rate in the study population. This finding is consistent with the 2008 NDHS (NPC and ICF Macro, 2009, pp. 34-35) report for the southwest region, which also reported a high literacy rate for women in this region. These findings show that a substantial proportion of births in Mokola were unregistered. These results are similar to those from several studies (NPC and ICF Macro, 2009; NBS 2005; and UNICEF, 2007) which suggest the under registration of births in Nigeria.. Findings from UNICEF (2007) on birth registration in Nigeria were similar with a reported coverage of 28.2%. In the South West region, the 2008 NDHS (NPC and ICF Macro, 2009, pp. 27-28) survey estimated a low birth registration rate at 48.2%.

The marked under-registration found in this study confirms the presence of a huge gap in infant and under 5 information in Nigeria. This could negatively affect evidence-based decision making in public health where planning and evaluation of strategies and interventions depend on fertility and mortality information. Estimates based on the sighting of birth registration certificates for all children under age five represents the average level of registration completeness five years prior to the survey. Estimates based on those born during the previous 12 months before the survey represent the performance for the year just before the survey, that is, birth registration may not be lower than the 34.8% mark. However, these estimates could be lower only if respondents selectively fail to report birth registration status of their deceased infants and if these deceased children were more likely to have been unregistered.

Whereas, the upper limit of estimates indicates that birth registration coverage might have been as high as 84.8%. This limit takes into consideration certificates sighted by interviewers as well as affirmations by mothers who said they registered their children's births but could not produce certificates. This estimate is significantly higher than that of 50.3% deduced for urban area for 1999 – 2004 by UNICEF (2007) and 30% inferred by the National Population Commission (2008). Estimates based on the stable population model are much lower than those based on the availability of birth registration certificates (they are about half of the latter). This could be attributed to the assumptions and criteria of the stable population model. It assumed stable characteristics: constant mortality and fertility rates and no migration during the years preceding the survey. Populations are usually not precisely stable especially in an urban area like Mokola and these assumptions are not likely to hold. Furthermore, they are less reliable and those based on the sighting of birth certificates should be preferred.

A common feature of both estimates; those based on existence of birth certificates and stable population model, are far from being complete and many children were unregistered between 2002 and 2006. Also, it is therefore abnormal for estimates from 12 months (34.8% to 84.8%) prior to the survey to be lower than five years (36.5% to 91.1%) preceding the survey, which could simply indicate a decline in birth registration. Late registration of births could be responsible for such observed differences. The most preferred estimate is that based on the actual sighting of the birth certificates by interviewers. This is because this estimate is the most reliable and based on evidence with the actual sighting of certificates as opposed to that obtained from the stable population model and estimates from mothers or care takers who claimed they registered their births.

The Brass Growth Balance method (1975) was used to estimate the completeness of death registration for those aged five and above. A completeness of death registration of 21.0% was estimated. This method assumed a stable population over a long period of time and the same growth rate for all ages. The validity of the estimate of death registration coverage would be questionable if these conditions were violated, particularly the condition of a constant mortality rate. In this analysis, the difference between the estimated growth rate and the reported growth rate varied and shows that the assumption was fairly violated. The most probable reason for such a violation is that completeness is unlikely to be the same for children and adults and may not be the same for all adult ages. However, estimates obtained from the Brass Growth Balance method may not be reliable. This is because the method assumes a stable population, which means there have been no changes in fertility or mortality and no migration. This is not the case in Mokola as it is a highly commercial area. The Bennett-Horiuchi (1981) and Preston-Coale (1983) methods do not stipulate such conditions but they require two censuses. Since the last two censuses in Nigeria were in 1991 and 2006, using these methods would not give a recent picture of the state of death registration completeness. Not many studies have been carried out in the study area to evaluate the completeness of death registration system in Nigeria. The Igbo-Ora study showed that death registration was approximately 87% complete; however, for children under one year of age, death registrations were only 49% complete (Ayeni & Olayinka, 1978).

One limitation of this study was a challenge in obtaining information about deaths that occurred in the households during the survey. Mothers who lost their children at younger ages were reluctant to disclose information regarding their dead children. It is likely that this limitation may have contributed to the bias of reports on death registration. Due to the small numbers of deaths reported, caution is warranted in putting emphasis on the results, as this will affect the precision of estimates. In birth registration, examination of the certificates could mean that children who died before the survey are not represented. Furthermore, the results of the study are generalizable to Mokola and cannot be extrapolated to local governments or even Oyo State.

Despite the limitations to the study, the findings provide a baseline for comparison with assessment for subsequent years in Mokola. The study further highlights the need to utilize indirect demographic techniques to assess the completeness of vital registration systems. Vital registration systems can adopt the use of home visitors or village health workers can be adopted, as demonstrated by the Igbo-Ora study (Ayeni & Olayinka, 1978) to collect vital events from a representative sample of the population.

Conclusion

A gross proportion of births and deaths were unregistered in Mokola, which has created a huge gap in fertility and mortality data. Under reporting of births and deaths may have severe consequences for policy formulation, health planning, research and resource allocation at all levels. Furthermore, monitoring of indicators for the Millennium Development Goals on child survival (MDG-4) will remain arbitrary as long as figures are based on estimates and surveys only and not on data from a vital registration system. A

more proactive approach should be adopted in improving and strengthening the vital registration system in the country. Practical strategies to improve the systems should be developed by identifying the problems that are resolvable and the level of funding required in addressing them. Priorities should be set for interventions, with specific benchmarks to monitor progress. It must be recognized that political will is an essential component, and the need to revitalize vital registration and statistics must be placed high on the development agenda. The experiences of other countries that have attained complete coverage of births and death registration should be examined for possible replication. The ultimate goal should be the development of a high quality vital registration system, and vital registration completeness should be regularly appraised. It is therefore important to conduct further studies to identify ways of improving birth and death registration in Nigeria.

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Box 1: Calculation of completeness of birth registration by stable population model

l(2) estimated from mortality data = 0.9532

C(30) percentage aged under 30 years old = 0.6587

Level 20 of the Coale-Demeny West model was thus selected.

Birth rate of matching model stable age distribution

A birth rate of 32.43 per 1000 of the population, therefore, the total expected births in the population is

$$\frac{32.43 \times 6360}{1000} = 206$$

Calculated estimate of completeness of birth registration (%)

(Lower estimate) Mother said so = $\frac{33 \times 100}{206}$ = 16.0%

(Upper estimate) Certificate sighted by interviewer+ Mother said so = (23 + 33) / 206 x 100 = 27.2%