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ESTIMATION OF LEVELS AND TREND OF INFANT AND CHILD MORTALITY IN NIGERIA

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ABSTRACT

Estimation of levels and trend of infant and child mortality in Nigeria is discussed in this paper. Trussell variant of the original Brass method has been applied to the 1981/82 NFS, 1990 NDHS, 1991 PES and 1999 NDHS data to derive the estimates of the indices used in discussing mortality levels and trend. Results of the analyses indicate that the East pattern of the Coale-Demeny model life tables appear to be the most appropriate to describe the mortality pattern in Nigeria. Although infant and child mortality level is still relatively high, there are indications that it is declining. It has therefore, been recommended that the East pattern of the Coale-Demeny model life tables be adopted in estimating demographic parameters in Nigeria. Further improvements on the levels of maternal and child health care, especially during pregnancy, delivery, and up to the age five years have also been recommended.

KEYWORDS : Estimation, levels, trend, Infant and child mortality, Indirect technique

INTRODUCTION

Mortality, as one of the components of population change, plays an important role in determining the growth rates, age structure, quality and health status of a population. Therefore, information on mortality levels and trend forms an indispensable part of population projections and estimation of other demographic parameters necessary for development plans, determining housing, educational, health and social needs of a population. It is also essential for disease control, evaluation of public health progammes, determining policy guidelines and actions needed to improve public health.

The incidence of death has been shown to vary with age. Results of many studies have shown that a wide range of death rates are found at ages less than five years. In developing countries, about half of all deaths occur among children of pre-school age ((UN (1973), Population Reference Bureau PRB (2001)). Hence, the emphasis on the study of infant and childhood mortality.

Estimation of levels and trend of infant and child mortality in many developing countries, including Nigeria, has been hampered in the past by paucity of accurate demographic data. However, in recent times the data situation has improved in terms of quantity, but quality still needs to be improved. As a result, estimation of demographic parameters, including infant and childhood mortality still depends, to a large extent, on indirect techniques. The Trussell variant of the original Brass method (indirect technique) of estimation of infant and child mortality are discussed in Section 2, while the application of the method to the 1999 NDHS data is presented in Section 3.

One of the problems of the application of the Brass method of estimating infant and child mortality is choosing the appropriate pattern of the Coale-Demeny model life tables for the study population. The North family has always been assumed to be the most appropriate pattern for sub-Saharan African countries based on reasons, which are considered to be more speculative than empirical. However, results of some recent studies have shown that this may not be true for some sub-Sahara African countries (Tesfay (1989), Tamen (1992) and Nwogu (1998)). Tesfay(1989) considered this problem and suggested the use of the methods of Minimum Range of expectation of life at birth (e_o) and Mean Absolute Deviations of the expected from the observed proportions of children dead, among other methods, to determine the appropriate pattern of infant and child mortality implied in any study data. These methods have been applied to the 1999 NDHS data in Section 3.0.

Infant and child mortality levels are influenced by biological, economic, social and cultural factors. The factors that have been associated with high infant and child mortality include genetic factors, damage during gestation or birth, poor maternal health, adverse social conditions, diseases arising from inadequate care during pregnancy, delivery and the immediate postpartum period. On the other hand, improved health facilities, disease control, availability of good food, water, improved environmental conditions, maternal and child health have been associated with mortality decline. (UN (1973), Kusiako, Ronsmans and Vander pal (2000))

In Nigeria a lot of resources have been committed to health care delivery, immunization, disease control, provision of good foods, water and other facilities and to improve environmental conditions. There are indications from the 1999 NDHS that the status of maternal and child health care, Nutrition and vaccination have improved over what was found

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in the 1990 NDHS. In Section 4, the levels and trend of infant and child mortality were examined to see if mortality has declined in response to the improved conditions and facilities.

METHODOLOGY

Secondary data drawn from the 1999 Nigeria Demographic and Health Survey (NDHS), 1991 Nigeria Population Census Post-Enumeration Survey (PES), 1990 NDHS and 1981/82 Nigeria Fertility Survey (NFS) were used for this study. The 1999 NDHS data were used to determine the current level of infant and child mortality, while the others were used in combination with it to discuss the trend. The data used were on the number of children dead (CD) among children ever born (CEB) classified by age of the mothers in the reproductive age range (15-49 years)

The Trussell (1975) variant of the original Brass (1964) method was used to obtain the estimates of infant and child mortality. To apply this method, a set of multipliers, K(i) were used to convert the proportions of children dead, D(i) among children ever born (CEB) to life table probabilities of dying ($_jq_o$) between ages zero and j using the relationship,

$$_jq_o = K(i)\, D(i), \quad i = 1,2,3\ldots7 \; ; \; j = 1,2,3,5,10,15,20 \qquad \ldots\ldots (2.1)$$

Where,

$$K(i) = a_i + b_i (P_1 / P_2) + c_i (P_2 / P_3) \qquad \ldots\ldots (2.2)$$

P_i, (i =1,2,3) are the mean parities of women in the age groups 15-19,20-24 and 25-29

The Trussell variant coefficients, a_i, b_i and c_i, used to determine K(i) are given in Appendix A for the four families of the Coale-Demeny model life tables.
This method assumes that fertility and mortality in the study population have remained constant in the years preceding the surveys. This assumption is not likely to be true in recent times in most developing countries. However, the method has also been shown to be robust for moderate changes in fertility (UN (1989))

The corresponding life table probabilities of surviving (l_j) between ages zero and j are obtained by subtraction, ie

$$l_j = 1 - {}_jq_o \qquad \ldots\ldots (2.3).$$

The mortality levels and expectation of life at birth (e_0) implied by $_jq_o$ are obtained from the model life tables by interpolation. The periods T(i) (number of years before the survey), to which $_jq_o$ refer are estimated using the expression,

$$T(i) = a'_i + b'_i (P_1/P_2) + c'_i (P_2/P_3) \qquad \ldots\ldots (2.4)$$

Where, a'_i, b'_i and c'_i are Trussell variant of the coefficients used in determining the reference periods and are given in appendix B

The choice of appropriate pattern of infant and child mortality implied in the 1999 NDHS data was achieved using the methods of Minimum Range of e_0 implied by $_jq_o$, (j = 2,3 and 5) and the Minimum Mean Absolute Deviations (MAD) of the expected ($D^s(i)$) from the observed (D(i)) proportions of children dead suggested by Tesfay (1989). The estimates of the life table probabilities of dying ($_jq_o$) and their implied mortality levels and e_0 were used to discuss the levels and trend of mortality.

ESTIMATION OF LEVELS AND CHOICE OF APPROPRIATE PATTERN OF INFANT AND CHILD MORTALITY

Estimation of Levels of Infant and Child Mortality

This Section discusses the estimation of the levels of infant and child mortality and choice of mortality pattern, which best describes the pattern in the 1999 NDHS data. Application of the Trussell variant of the Brass method to the 1999 NDHS data is presented in Table 3.1 for the four families of the Coale-Demeny model life tables.

As Table 3.1 shows, the index of infant mortality ($_1q_o$) ranges from about 96 per 1000 live births in the South to about 111.0 per 1000 live births in the East families. The index of childhood mortality ($_4q_1$) ranges from about 34.2 per 1000 live births in the East to about 52.9 per 1000 live births in the South families, while the index of mortality among children under five years ($_5q_0$) ranges from about 140 per 1000 live births in the North to about 144 per 1000 live births in the South models. The three mortality indices are clearly not the same for the four families. Therefore, we need to identify the family which best describes the situation in the study data.

Table 3.1: Estimation of Infant and Childhood Mortality from the 1999 NDHS Data

		Mean No of Children		Proportion		North					South				
Age Group	No of Women	Ever-Born P(i)	Dead CD(i)	Dead D(i)	i	k(i)	$_iq_0$ D(i)k(i)	$_i$ $1-_iq_0$	LVL	e_0	k(i)	$_iq_0$ D(i)k(i)	$_i$ $1-_iq_0$	LVL	e_0
15-19	1,775	0.25	0.03	0.1200	1	0.8378	0.10054	0.89946	1429	51.47	0.7999	0.09599	0.90401	17.50	59.34
20-24	1,521	1.12	0.14	0.1350	2	0.9633	0.12041	0.87959	14.74	52.57	1.0117	0.12646	0.87354	16.90	57.93
25-29	1,516	2.51	0.33	0.1315	3	0.9677	0.12725	0.87275	15.24	53.79	1.0313	0.13562	0.86438	17.07	58.32
30-34	1,137	3.94	0.54	0.1371	5	1.0200	0.13984	0.86016	15.57	54.61	1.0490	0.14382	0.85618	17.14	58.48
35-39	992	5.24	0.77	0.1469	10	1.0900	0.16012	0.83988	15.65	54.80	1.0700	0.15718	0.84282	16.91	57.94
40-44	695	5.95	0.65	0.1429	15	1.0748	0.15359	0.84641	16.46	56.80	1.0471	0.14963	0.85037	17.56	59.48
45-49	568	6.33	1.18	0.1864	20	1.0487	0.19548	0.80452			1.0308	0.19214	0.80786		
All	8,206	2.85	0.42	0.1474											
$_4q_1$							0.04372					0.05291			
Range										2.04%					0.55%

		East					West				
i	k(i)	$_iq_0$ D(i)k(i)	$_i$ $1-_iq_0$	LVL	e_0	k(i)	$_iq_0$ D(1)k(i)	$_i$ $1-_iq_0$	LVL	e_0
1	0.9224	0.11069	0.88931	16.20	56.06	0.8792	0.10550	0.89450	14.76	52.82
2	1.0269	0.12836	0.87164	16.22	56.11	1.0185	0.12731	0.87269	14.96	53.29
3	1.0170	0.13374	0.86626	16.34	56.40	1.0129	0.13320	0.86680	15.16	53.77
5	1.0292	0.14110	0.85890	16.38	56.50	1.0336	0.14171	0.85829	15.31	54.13
10	1.0536	0.15477	0.84523	16.23	56.14	1.0566	0.15521	0.84479	15.29	54.09
15	1.0377	0.14829	0.85171	16.79	57.49	1.0462	0.14950	0.85050	15.98	55.74
20	1.0270	0.19143	0.80857			1.0372	0.19333	0.80667		
All										
$_4q_1$		0.03420					0.04048			
Range					0.39%					0.84%

Table 3.2: Calculation of the Mean Absolute Deviations of $D^s(i)$ from D(i) in the 1999 NDHS Data. (Entry Parameter = $_5q_0$)

	Proportion of Children Dead	Age of Mother				100x MAD
FAMILY		20-24	25-29	30-34	35-39	
	OBSERVED: D (i)	0.1250	0.1315	0.1371	0.1469	
NORTH	EXPECTED D^s (i)	0.1124	0.1258	0.1372	0.1486	
	| D(i) -D^s(i) |	0.0126	0.0057	0.0001	0.0017	0.50
SOUTH	EXPECTED: D^s(i)	0.1218	0.1304	0.1371	0.1426	
	| D(i) - D^s (i) |	0.0032	0.0011	0.0000	0.0043	0.22
EAST	EXPECED:D^s(i)	0.1223	0.1307	0.1371	0.1437	
	| D(i) -D^s (i) |	0.0027	0.0008	0.0000	0.0032	0.17
WEST	EXPECTED:D^s(i)	0.1185	0.1288	0.1372	0.1465	
	| D(i) -D^s(i) |	0.0065	0.0027	0.0001	0.0043	0.34

Choice of Appropriate Mortality Pattern

The results of the application of the methods of minimum range of (e_0) and minimum mean absolute deviations of D^s(i) (the expected proportions of children dead) from D(i) (the observed proportions of children dead) to the 1999 NDHS data are presented in Tables 3.1 and 3.2 respectively.

As Table 3.1 shows, the range of e_0 is minimum in the East family with about 0.39 years. The mean absolute deviations of D^s(i) from D(i), as shown in Table 3.2, is also minimum in the East family. Thus, indicating that the appropriate pattern of infant and childhood mortality implied in the 1999 NDHS data may be the pattern in the East family of the Coale-Demeny model life tables. The results of similar analyses based on the 1991 PES data indicate that age pattern of infant and child mortality implied in the data is also the pattern in the East family. Using these methods, Nwogu (1998) has shown, that the families that appear to describe the mortality patterns best are; the East family for the 1981/82 NFS data and the North family for the 1990 NDHS data. Based on these results he suggested that the East pattern be assumed for the country until other results prove otherwise. Using these methods also, Tamen (1992) observed that the appropriate pattern for Cameroon data is the pattern in the East family.

Since most of the available data tend to suggest that the East pattern may be the most appropriate to describe the infant and childhood mortality in Nigeria, it would be reasonable to adopt it (the East pattern) in our subsequent discussions in this study. The East pattern, it could be recalled, is characterised by high infant mortality rate and increasingly high mortality at older ages (50years and above)

Based on the East family, the infant mortality rate ($_1q_0$) implied in the 1999 NDHS data is about 111 per 1000 live