CONSTRUCTION OF A NATIONAL LIFE TABLE FOR NIGERIA FROM ESTIMATES OF UNDER-FIVE MORTALITY

BACKGROUND

The importance of life table in demography and other related disciplines cannot be over-emphasized. The basic data input needed for life table construction are the age-specific death rates calculated from information on deaths by age and sex (from vital registration) and population by age and sex (from census). The conventional data source for life table construction are vital registration systems and population censuses. However, in most developing countries there is uncertainty about the accuracy of population counts at censuses while vital registration system is grossly deficient in completeness. In order to circumvent this problem, demographers have developed the concept of Model Life Tables (MLT). The popular MLTs includes United Nations MLT (1955), Coale and Demeny Regional MLT (1966 and 1983), The Lederman MLT (1969), United Nations MLT for developing countries (1982) and the Brass Relational Logit Life Table System (1971).Reviews of the methods and limitations of these tables have been highlighted in a few publications (e.g. (INDEPTH, 2004; Murray et al. , 2003).

Though, there have been some extensions/modifications to the relational logit life table systems (Murray et al. , 2003), these are not as popular and widely used as the earlier MLTs. In recent times, one of the greatest limitations of the MLTs is the fact that they do not fit the age pattern of mortality in developing countries especially SSA(Bicego and Ahmad, 1996; Mahy, 2003). This stems partly from the fact that the MLTs were based on historical data from European populations. Another reason for the poor fit bothers on epidemiologic and demographic transitions in SSA which canot be claimed to have perfectly mirrored the historical patterns(Guillot et al. , 2012). For instance, the MLTs were produced when pandemic such as HIV/AIDS was not in existence.

In an effort aimed at provision of MLTs that fits the prevailing mortality pattern in SSA, the International Network for Demographic Evaluation of Populations and Their Health (INDEPTH) produced a set of MLT (INDEPTH, 2004). INDEPTH is a consortia of Health and Demographic Surveillance Sites (HDSS) spread across Asia and SSA. Data from HDSS across 17 African countries were aggregated, validated, assessed for quality and analysed to generate the INDEPTH MLTs for SSA (INDEPTH, 2004). The network adopted the relational logit system in the generation of the MLTs. These MLTs provide unique opportunities to apply the relational logit method and generate national life tables for African countries based on standard schedules in the INDEPTH MLTs. Household surveys such as World Fertility Survey, Demographic and Health Survey, Multiple Indicator Cluster Survey (MICS) have been the common sources of information on mortality especially in childhood in SSA. Occasionally, DHS provides estimates of adult mortality however, life tables are rarely generated.

The purpose of this study are (i) to generate Life Table from under-five mortality using INDEPTH model life table, (ii) compare the Nigeria life table from INDEPTH model life table to those from other model life tables: The African Standard Life Table and Coale- Demeney Regional Model Life Table, (iii) compare the national life table from under-five mortality to estimate derived from linking the childhood and adult mortality.

METHOD

Data Source: The under-five mortality rate estimated by Demographic Health Survey 2013 for Nigeria was used. Nigeria Demographic and Health Survey (NDHS 2013) was a cross sectional study. The sample for the 2013 NDHS was nationally representative and covered the entire population residing in non-institutional dwelling units in the country. The 2013 NDHS is the fifth DHS in Nigeria, following those implemented in 1990, 1999, 2003, and 2008. A nationally representative sample of 40,320 households from 904 primary sampling units (PSUs) was selected. All women age 15-49 who were usual members of the selected households or who spent the night before the surveys in the selected households were eligible for individual interviews.

Procedure for estimating life tables using INDEPTH MLT standard

INDEPTH MLT standard schedules which are provided in form of survivor function (lx) presented in table 2 were used. The standard has two patterns with the first pattern (pattern 1) representing population in Central/West Africa where HIV prevalence of HIV is below 10%. Pattern 2 represents East/Southern Africa – countries with HIV prevalence in excess of 10%. Detailed steps for the construction of life tables are adapted from the INDEPTH MLT documentation manual (INDEPTH, 2004) as follows and repeated for each gender in each of the six regions of Nigeria:

Step 1: using ${}_1q_0$ and ${}_5q_0$, l_1 and l_5 were computed as : $l_1 = 1-{}_1q_0$ and $l_5=1-{}_5q_0$

Step 2: two parameters (α, β) of the relational logit system were derived as:

$$\beta = \frac{\log it(l5) - \log it(l1)}{\log it(ls5) - \log it(ls1)}$$

Where ls1 and ls5 are the values of lx in the standard schedule at exact ages 1 and 5 respectively. While

$$\alpha = \log it(l_5) - \frac{((\log it(l_{s5}))(\log it(l_5) - \log it(l_1)}{\log it(l_{s5}) - \log it(l_{s1})}$$

These values of α and β were drived from the Brass relational logit formular:

$$\log it(l_1) = \alpha + \beta \log it(l_{s1})$$
$$\log it(l_5) = \alpha + \beta \log it(l_{s5})$$

Step 3: the values of α and β from step 2 above were then used to obtain the survival function at exact ages x for the index population using the following relationships

$$l_x = \frac{1}{\gamma_x[1 + e^{2(\alpha + B \log it(lsx))}]}$$

Lsx are read from the standard schedule while γx is an adjustment factor for the fact that lx was derived from l1 and l5. The values of range from 0.5 – 7.5 depensing the on the standard pattern and the value of β. These are also available in the manual.

Step 4: logit of the estimated values of lx are regressed on the logit of the standrd values, lsx to obtain new values of α and β.

Step 5: the final smoothed values of lx are obtained from the lates values of α and βfrom step 4 above using the expression:

$$l_x = \frac{1}{1 + e^{2(\alpha + B \log it(lsx))}}$$

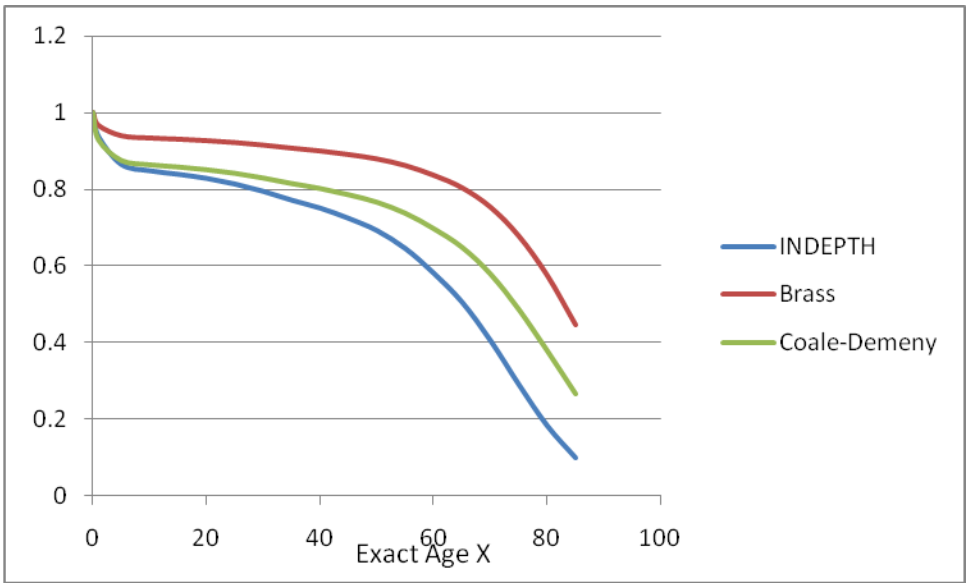
Step 6: using the smoothed lx values, abridged life tables were then estimated using standard techniques.

Note: The same procedure was used in estimating life tables using the African Standard Life Table(Brass) and Coale-Demeny Regional Model life Tables.

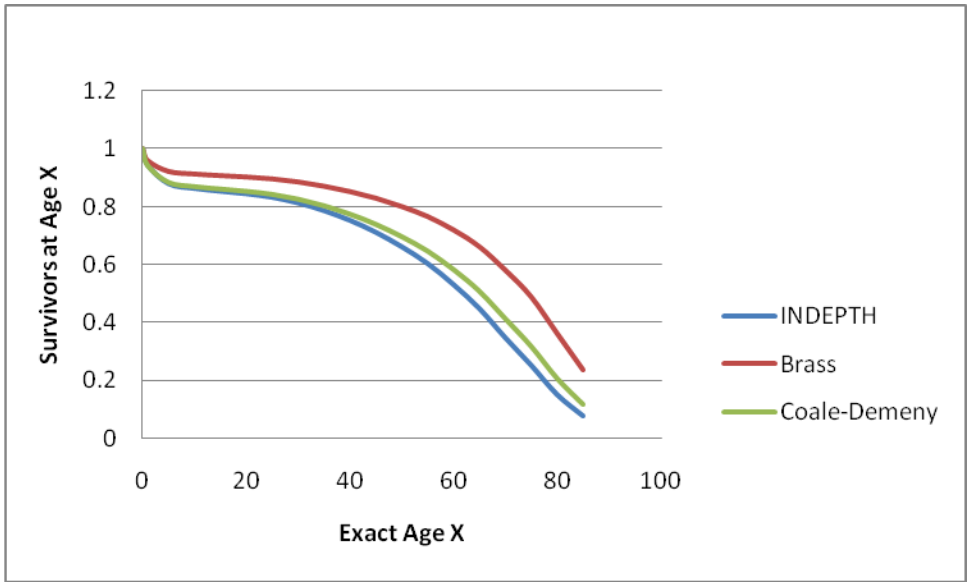
PRELIMINARY RESULTS

Nigeria recorded heavy mortality evidenced by a steep drop in the survival curve in childhood and from ages 50 years onward. The study found that the age pattern of mortality is similar among the three model life tables; that is the survival rate begin to fall noticeably around 50years. However, the INDEPTH MLT depicts lower survival rate than others.The survival rates for the three life tables were always very close in the childhood years (0-5) after which they begin to be differentiated. The age pattens of mortality for males and females are similar.

Female Survival function from Under-five Mortality rate NDSH 2013



Male Survival function from Under-five mortality rate NDSH 2013



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