Levels and Trends of Early Childhood Mortality in Kenya: New Estimates Based on the Own Children Method

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Researchers in Kenya – as elsewhere in Sub-Saharan Africa where demographic data are limited and defective – rely on indirect approaches to provide childhood mortality estimates to the ever increasing variety of users. Brass technique (Brass et al. 1968; United Nations 1983) is often the most widely used procedure for this purpose, and continues to revolutionize childhood mortality estimation among other less-developed regions of the world as well (Preston, Heuveline, and Guillot 2001).

One of the fundamental assumptions of the Brass technique is that fertility has remained fairly constant in the recent past. However, this assumption poses a serious challenge to the contemporary application of the technique. Evidence from the Demographic and Health Surveys (DHS) and other sources shows that many Sub-Saharan African countries, including Kenya, have experienced somewhat dramatic fertility declines since the 1980s (see also Brass and Jolly 1993; Foote, Hill, and Martin 1993; Caldwell, Orubuloye, and Caldwell 1992). Consequently, obtaining robust estimates of childhood mortality rates now requires application of methods that circumvent this violable assumption. To this end, the own children method – also known as the surviving children technique – is desirable.

Unlike the original Brass technique, the own children method facilitates estimation of childhood mortality rates without making assumptions about the recent fertility patterns. It is a partial birth history reconstruction procedure that links surviving children recorded on the household schedule of a census or survey to their biological mothers. Once matching is achieved the children are back-projected by age until the reported number of children ever born is reproduced. The following equation, adapted from Preston and Palloni (1977), summarises the procedure for modeling childhood mortality based on the own children method:

$$\frac{B}{S} = \int_0^{\alpha} \frac{c_s(a)}{p(a)} da \quad \text{...(1)}$$

In this equation B and S are the total children ever born and surviving respectively; $p(a)$ is the life table probability of surviving to age *a;* $c_s(a)$ is the proportion of surviving children aged a at the time of interview; and α is the number of years since the birth of the first child to reporting women.

Now, most censuses (and surveys) data contain records of children ever born (B) and surviving (S), while $c_s(a)$, the age distribution of surviving children, can easily be obtained from the household roster. Thus, the only unknown in equation (1) is the *p(a)* function. If one, for instance, assumes that *p(a)* belongs to a given one parameter model life table system, there can only be a unique mortality level that matches the $\frac{B}{S}$ and $c_s(a)$ functions. Once found, *q(x)* values can easily be determined from that system, sometimes through interpolation.

One of the great advantages of the own children method over the Brass technique, therefore, relates to its ability to map out the fertility history of reporting women by way of the $c_s(a)$ function, which helps to resolve the *p(a)* [or *q(x)*] function without requiring assumptions on the recent fertility patterns. The technique was originally applied to fertility estimation (see, for instance, Cho, Retherford, and Choe 1986), but it has also been applied successfully for the estimation of childhood mortality rates (see Preston and Haines 1991 1984).

In this paper we apply the technique to 1989 and 1999 Kenyan census data to examine the trends in childhood mortality rates. Census data are preferable because they provide nationally representative estimates. Additionally, they have a great potential for making robust sub-national or areal estimates, which is important for countries like Kenya with regionally diverse demographic and socio-economic conditions.

Matching of children to their biological mothers is done at the household level, and facilitated by the "Relationship to Head of Household" codes, and the age difference between mother and child, which must fall within the reproductive age span. A matching software developed by the East-West Centre is available for this purpose. Opiyo and Levin (2006) have already obtained the mother-child matrix for the 1989 and 1999 Kenya Census, which we have used in this study. The values of *p(a)* are obtained from the North family of the Coale and Demeny (1966) model life table system. We have confined the analysis to children of younger women in order to mitigate potential biases occasioned by out-migration of older children.

The preliminary results underscore the usefulness of the method in providing robust rates through alleviating biases occasioned by contemporary changes in fertility and mortality patterns. Further, the importance of the technique – when used in conjunction with census data – in providing robust small-area estimates of childhood mortality is emphasized. These estimates can be plotted on GIS-based maps to help identify "risky-corridors" of child survival. Needless to over-emphasize, there is also a great potential for overlaying the maps with other areal human development indicators, for purposes of planning and further research.

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