Regional Differences in Childhood Mortality in Sub-Saharan African Countries: Exploring the Role of Poor Environment and Household Poverty

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INTRODUCTION

Geographic location affects child's survival and health. Poor environment or a polluted neighbourhood might exacerbate the problems of poor health and the consequent pressure to childhood diseases, predisposing children in those areas to high mortality risks. Understanding the link between child survival, health, geographic location, and poverty is crucial for developing countries. This paper contributes to this by using the Demographic and Health Surveys (DHS) household survey data to analyze the impact of poverty and poor location on childhood mortality in sub-Saharan Africa.

Malawi, Nigeria, Tanzania and Zambia are among Sub-Saharan African countries most affected with child mortality. Their under-five child mortality rates of 183 per 1000 for Malawi, 183 for Nigeria, 165 per 1000 Tanzania, 202 per 1000 for Zambia are among the highest in the world (World Bank, 2003). The large area covered by these countries together with geographic, socio-economic and ethnic differences lead one to expect substantial spatial variation in childhood mortality risk. One contributory cause can be expected to be the country's poverty level or poor environment, which is concentrated in rural areas or slum area in big cities and which has led to substantial health damage. Poverty or poor environment might exacerbate the problems of poor health and prevalence of childhood diseases, hence high mortality risks. These effects are clearly not just an aggregation of individual characteristics. They are location effects. Clearly, quantifying the location effects on child survival is important to our understanding of the processes that create health or mortality inequality.

Many DHS surveys in Sub-Saharan Africa include questions on child mortality and poverty status; they provide a unique opportunity to explore the interrelationship. Because little is known about such links, the question of quantifying the location and poverty effects on child survival is the most important research question for this paper. Knowledge about how location or poor environment affects childhood survival is not just of academic interest; it has important public-health implications. By identifying groups or settings in which mortality risk is high, preventive actions can be more effective. As Malawi, Nigeria, Tanzania and Zambia attempt to meet the Millennium Development Goals (MDGs), including those for child survival, the main causes of child mortality inequality overall and within countries has to be addressed which is poor prenatal conditions, poor access to health care, infections (HIV/AIDS account for 8 per cent of all under-five deaths in the region) and diseases (Global Health Council, 2006).

DATA AND METHODS

The data are from the recent Demographic and Health Surveys from Malawi (DHS, 2000), Nigeria (DHS, 2003), Tanzania (DHS, 2004) and Zambia (DHS, 2002). We use appropriate statistical techniques to explain differences across a highly disaggregated level of these countries (districts) in the risk of child mortality using the household socio-economic characteristics that are observed in our data and consider non-linear effects of some covariates. Time to the occurrence of child's death may differ in different age groups. Thus, it is desirable to investigate separately the risk of death of a child in the first month (possible due to genetic factors) and in the remaining months (possible links with poor environment or poverty). We will use flexible methods to quantify the poverty area's effect on mortality and to allocate these spatial effects to structured and unstructured (random) components. This will draw on Bayesian geo-additive methods of spatial statistics, taking advantage of advances in Geographic Information Systems (Fahrmeir and Lang, 2001; Kandala and Ghilagabar, 2006). The modelling of the structured and unstructured components is done jointly in one estimation procedure that thereby simultaneously identifies socioeconomic determinants, and the spatial effects that are not explained by these socioeconomic determinants. In this way, we are able to identify regional or district patterns of mortality that are either related to omitted socioeconomic variables that have a clear spatial pattern or point to districts poverty level or even epidemiological or environmental factors.

RESULTS

After controlling for the spatial dependence in the data, the determinants in the fixed part of the model show the importance on child survival of the following: mother's age and paternal education; household economic status; residence; the length of the preceding birth interval; the antenatal attendance; household size; and marital status of mother. The findings are generally as expected and consistent with the literature.

Children of highly educated "rich" father living in a urban areas large household are at lower risk of dying than other children (Kandala and Ghilagaber, 2006, Adeboya and Fahrmeir, 2005). Children born after a short interval (less than 25 months) are at higher risk of dying than other children. The adverse effects of short birth intervals are well documented and generally point to elevated mortality risks for children born after intervals of less than 24 months. Maternal depletion is one of the hypotheses of the pathway through which short preceding birth intervals affect child survival. These findings point to the potential for childhood mortality reduction that could result from successful efforts to improve and maintain adequate birth spacing in Malawi, Nigeria, Tanzania and Zambia.

An interesting finding from this study is the fact that, children living with both parents in Tanzania are at lower risk of dying than other children. Children living with the two parents may benefit from extra care of both parents. Alternatively couples may benefit from economies of scales for child care as well as in expenditures. The results also show higher rural mortality. Rural areas in Sub-Saharan African are under-developed and have less public service per capita and higher level of poverty compared with urban areas.

The time-varying effects of breastfeeding points to the importance of breast milk of the child after birth as recommended by WHO, that a child should receive exclusively breast milk after birth until 6 months of age (WHO, 1998).

This study has shown sizeable district-specific geographical variations in the level of under-five mortality in all four countries which need to be investigated in further work. Over and above the impact of household poverty level and other fixed effects, there appear to be unexplained residual spatial effects in all four countries that have a strong spatial structure. It is likely that climatic factors and associated diseases are responsible for this pronounced district pattern. Food insecurity associated with drought and flooding in Malawi and Nigeria, which is a result of hazardous effect of climate variation are among possible explanation for

these negative effects. Population density which can affect child's physical environment and susceptibility to infection may be another risk factor.

Figure 1 Estimated nonparametric effect of baseline time (child's age): shown are the posterior means within 80 percent and 95percent credible interval for Malawi (DHS 2000), Nigeria (DHS2003), Tanzania (DHS 2004) and Zambia (DHS 2001).

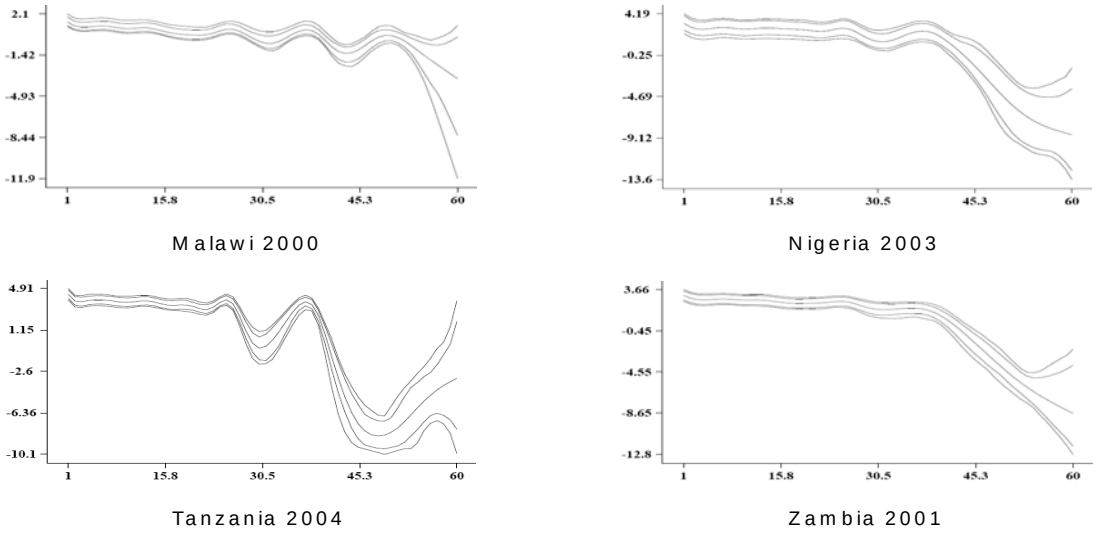


Figure 2 Estimated nonlinear of time-varying effect of breastfeeding in Malawi (DHS 2000), Nigeria (DHS2003), Tanzania (DHS 2004) and Zambia (DHS 2001).

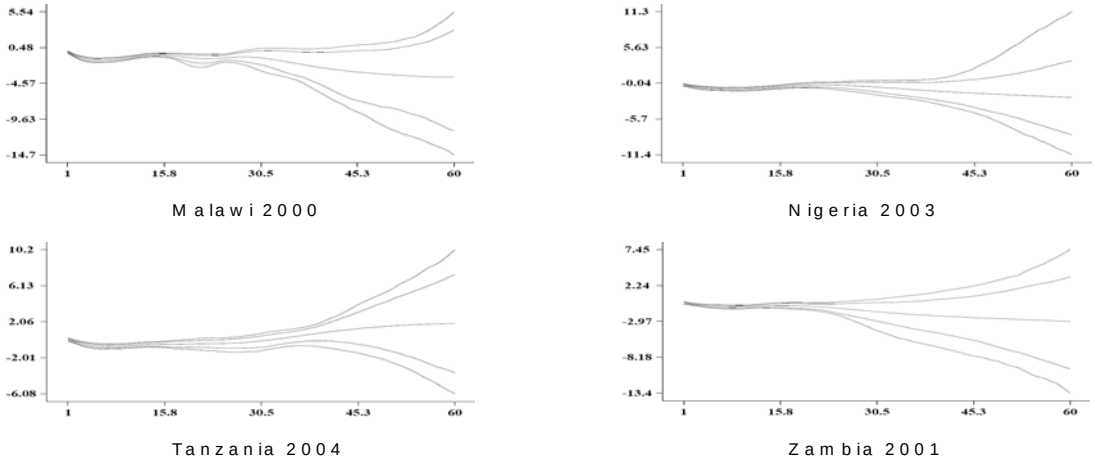
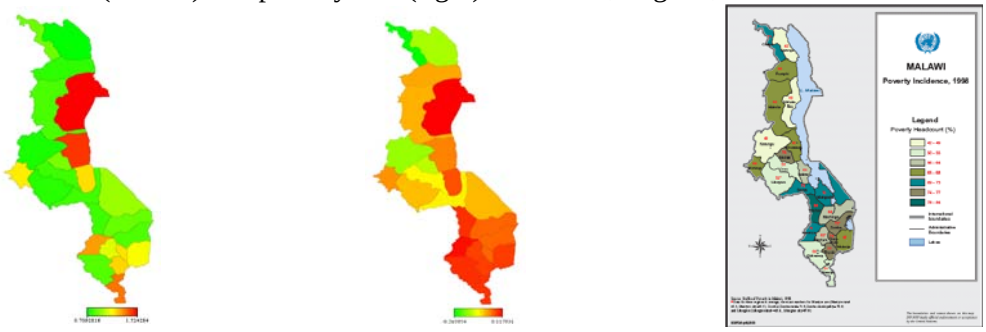
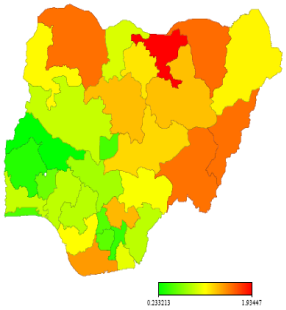
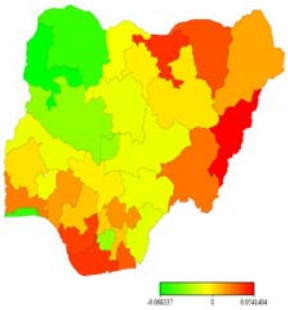


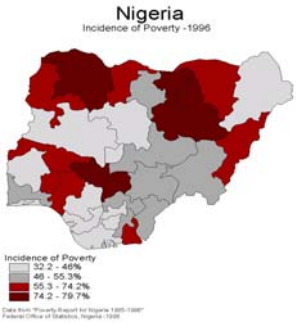
Figure 3 Crude under-five mortality rates (left), estimated posterior mean residual spatial districts effects (middle) and poverty rate (right) in Malawi, Nigeria, Tanzania and Zambia.



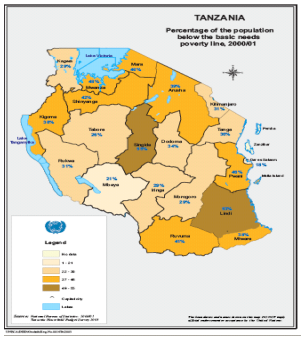
Malawi DHS 2000



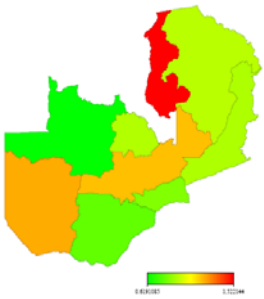


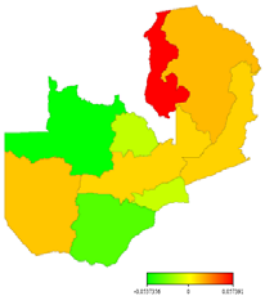


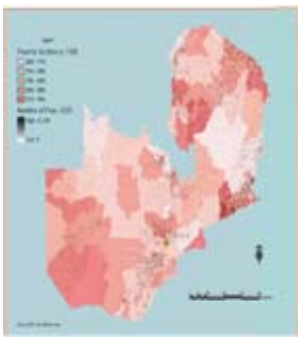
Nigeria DHS 2003



Tanzania DHS 2004







Zambia DHS 2001

Black coloured – high risk,
Shades of grey coloured – low risk

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