Magisterial District Childhood Mortality in South Africa: An Application of Geographically Weighted Regression

Martin Bangha

Extended Abstract:

Despite dramatic improvements in mortality in Africa during the second half of the twentieth century, Sub Saharan Africa still tops the world's mortality chart. According to current estimates for 2006 (UNICEF 2008), under-five mortality ranges from a low of about 15 per 1000 in Mauritius and Seychelles to a high of over 250 per thousand in Liberia, Angola, Niger and Sierra Leone. Childhood and adult mortality remain generally high with wide disparities among and within groups in the population.

Almost three decades ago in Alma-Ata, African delegates along with their counterparts from other nations and representatives of key international organizations jointly endorsed the declaration that called attention to gross disparities in health and mortality around the world. The Alma-Ata Declaration stated that such disparities were *politically, socially and economically unacceptable* (WHO 1978) and committed all countries to the ambitious goal of achieving "health for all by the year 2000". As the famous year 2000 approached, only partial success on the declaration had been recorded. By the 22nd anniversary of Alma-Ata in September 2000, the Millennium Declaration endorsed by 189 countries was adopted by the United Nations (UN 2000; 2005). The accompanying Millennium Development Goals (MDGs) are the current priorities of all member countries and commits all governments to the realization of 8 major goals and 18 targets by the year 2015. Of particular interest to this study is goal 4 that focuses on reducing child mortality. Allied to this goal is target 5 that recommends a reduction by two-thirds between 1990 and 2015. Progress towards this goal is assessed by tracking under-five mortality rates (U5MR) and the coverage of children immunized against measles, the leading cause of death among vaccine–preventable diseases (UN 2005). The MDGs have tended to emphasize global level results for monitoring progress than the reduction in gross disparities. Undoubtedly, as Heuveline *et al.* (2002) rightly noted, global results are invaluable for enabling policy makers to better prepare for the emerging health needs of different populations. However, they may be an inappropriate guide for assessing progress in health achievement.

South Africa is unique and distinct in several aspects. Coupled with its complicated history, South Africa presents a remarkable paradox of demographic extremes. Aside from the considerable amount of uncertainty (or contention) as to the exact levels of mortality due perhaps to its complicated history, there seems to be somewhat general consensus as to the recent trends, suggesting that fertility decline is approaching replacement level and mortality decline of the pre-1990s has leveled-off or even increased. For instance, estimates for the 1993-1998 period (Dept of Health 1999) indicates an U5MR of 59.4 per 1000 which compares to the estimate of about 60 based on the 2001 census while the current estimates suggest a value 69 per thousand (UNICEF 2008). While these relatively low U5MR, despite the apparent leveling-off, may distant South Africa from the list of African countries with disturbingly low U5MR, disparities in South Africa remain an issue of research and policy concern.

However, most analysis of mortality (and health outcomes) in South Africa have often focus on the provincial level differentials and especially have emphasized the racial and regional inequalities in the country that were produced by the apartheid policies and regime. While such studies are very important and have highlighted the magnitude of the effects of racial inequality on children's health in South Africa (Burgard 2002; Udjo 2005), they tend to mask considerable equally important disparities in health that exist within the population at different levels of geography. In this paper we examine district level variations in childhood mortality and consider some of the household inequalities that account for the observed differences. Knowledge of the geographic disparities is crucial for guiding health planners and policy makers. Indeed, targeting high risk districts could be a more feasible way of reaching the high risk populations and thereby achieving progress.

Data and Methods

Data used come from the 2001 South African census. According to the 2001 census geography, there are 9 provinces in South Africa subdivided into different hierarchies including 354 Magisterial Districts. The Brass-type information on children ever born (CEB) and children surviving (CS) was included in the census and are used to estimate and explore the spatial dimension of childhood mortality in the country. Geographically weighted regression (GWR) models are fitted at the Magisterial District level to examine the contribution of household poverty and other attributes to the observed district variation in childhood mortality. GWR is a statistical technique that allows the modeling of processes that vary over space and provides

valuable information on the nature of such processes than the traditional regression models. GWR results in a set of local parameters estimates for each relationship which can be mapped to produces a parameter surface across the study region (Fotheringham, Brunsdon and Charlton 2002). For an indicator of household poverty, we consider the proportion of households earning below 800 Rands per month.

Expected Findings

Most mortality analyses in South Africa have emphasized the provincial level differentials and especially the racial and regional inequalities in the country that were produced by the apartheid policies and regime. While such studies have highlighted the magnitude of the effects of racial inequality on children's health in South Africa (Burgard 2002; Udjo 2005), they have tended to ignore considerable disparities in health that may exist district levels. We therefore expect to find substantial spatial variability in childhood mortality that is linked to household poverty and other characteristics.

References

Brass, William. 1975. *Methods for Estimating Fertility and Mortality from Limited and Defective Data.* Chapel Hill: University of North Carolina Press.

Burgard, S. 2002. "Does race matter? Children's height in Brazil and South Africa." *Demography 39* (4), 763-790.

Department of Health 1999. *South Africa Demographic and Health Survey 1998: Full Report*. MRC South Africa and Measure DHS+.

Fotheringham, A.S., C. Brunsdon and M. Charlton 20002. *Geographically Weighted Regression: The Analysis of Spatially Varying Relationships*. Wiley: Chichester.

Heuveline, P., M. Guillot, and D.R. Gwatkin. 2002. "The Uneven Tides of the Health Transition." *Social Science and Medicine* 55: 313-322.

Udjo, E.O. 2005. "An Examination of Recent Census and Survey Data on Mortality within the Context of HIV/AIDS" In Zuberi et al. (eds.), *The Demography of South Africa*. M.E. Sharpe Publishers, New York: 90-119.

United Nations 2000. United Nations Millennium Declaration: Resolution adopted by the General Assembly, 55th Session, 18 Sept 2000.

UN Department of Economic and Social Affairs 2005. *The Millennium Development Goals Report 2005*. UN/DESA, Statistics Division, New York.

UNICEF 2008. *The State of the World's Children 2008*. New York.

World Health Organization 1978. Declaration of Alma-Ata: International Conference on Primary Health Care, Alma-Ata, USSR, 6-12 Sept 1978.