# Spatial Distribution of Childhood Mortality in South Africa

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Despite dramatic improvements in mortality in Africa during the second half of the twentieth century, Africa, at the turn of the 21st century remains the world's region with the highest mortality levels. Both childhood and adult mortality remain generally high with wide disparities among and within groups in the population. This has been compounded by the advent of the HIV/AIDS pandemic and the general economic dislocations of African economies during the mid 1980s to 1990 coupled with civil wars, natural disasters and other resistant communicable conditions alongside emerging non communicable conditions. In effect, mortality from non-communicable conditions has become increasingly predominant worldwide and recent evidence suggests that the incidence and prevalence of non-communicable diseases (NCD) in Africa is rising. For instance, Gwatkin et al. (1999) estimated that by 2020, NCD in Sub-Saharan Africa will account for almost 50% of the burden of disease (BOD). Such global estimates seem to confirm the expectation of the epidemiologic transition theory which suggests a shift in cause-of-death patterns from communicable diseases especially prevalent at infancy and childhood to problems resulting from non communicable conditions at the advanced ages (Heuveline et al. 2002; Murray and Lopez 1997; Wilmoth 2000). It is on this basis that recent years have seen attempts to refocus health policies in Sub-Saharan Africa away from communicable towards non-communicable diseases.

However, available evidence from recent censuses and surveys points to a stagnation or reversal of mortality gains in many African countries. Infant and childhood mortality, which started declining in most African countries following World War II through the 1960s and 1970s began to show signs of stagnation or reversal by the late 1980s (Ahmad et al. 2000; Walker et al. 2002; Hill 1993; Zuberi et al. 2003). The trend in stagnation or reversal does not seem to be uniform across countries or localities and population groups. Wide disparities exist among and within groups even in the same country. As such global estimates have been accused of frequently masking the "unfinished health agenda" in many countries. This research uses a unique potential of census data to investigate the within-country geographic disparities in child health in South Africa.

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 famous 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.

In this paper, we use a unique power of census data to assess the magnitude of geographic disparities in child health and to highlight the implication for using global level results in monitoring MDG progress. South Africa is unique and distinct in several aspects. Coupled with its complicated historical regime of apartheid South Africa presents a remarkable paradox of demographic extremes. Aside from the considerable amount of uncertainty as to the exact levels of mortality and fertility 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.

**Purpose**

The main question that this paper seeks to address is: what is the magnitude of geographic disparities in child health? More specifically, the levels of childhood mortality are estimated and the observed differences by province, magisterial district (MD), district municipal councils (DCs) and place of residence (urban-rural) are examined. The central aim therefore is to localize childhood mortality to the lower level of geography and thereby, highlight the magnitude of inequalities that may exist. This question is of crucial importance because identifying high risk areas where children are subject to increased risk of dying would guide health planners and policy makers in the effective use of scarce resources by targeting intervention programs on such high risk communities. In effect, targeting high risk areas (or districts) could be a more feasible way of reaching the high risk populations and thereby achieving progress. Also, this is important in informing understanding on the effectiveness of monitoring health progress

at the global level. District level differentials in a number of socioeconomic, in particular average monthly household expenditures and household environmental characteristics are considered in an attempt to explain the observed differences in mortality.

**Data and Methods**

The 2001 South African census is used for this analysis. The Brass-type information on children ever born (CEB) and children dead or surviving (CD-CS) was included in the census and will be used to estimate and examine the spatial dimension of childhood mortality in the country. The lowest possible analytical unit corresponding to the local administrative geography of South Africa consists of magisterial districts. To depict the implication for childhood mortality of membership in a particular residential group, we will estimate and map the probability of dying before reaching exact age 5 (Q5) by district. The standardized mortality index that combines child mortality experience of women can be computed and used. In addition to a statistical analysis of the observed pattern, GIS will be used to depict the spatial variation of U5MR meanwhile the relationship between childhood mortality and some potential covariates like population density will be summarized in a simple spatial regression model.

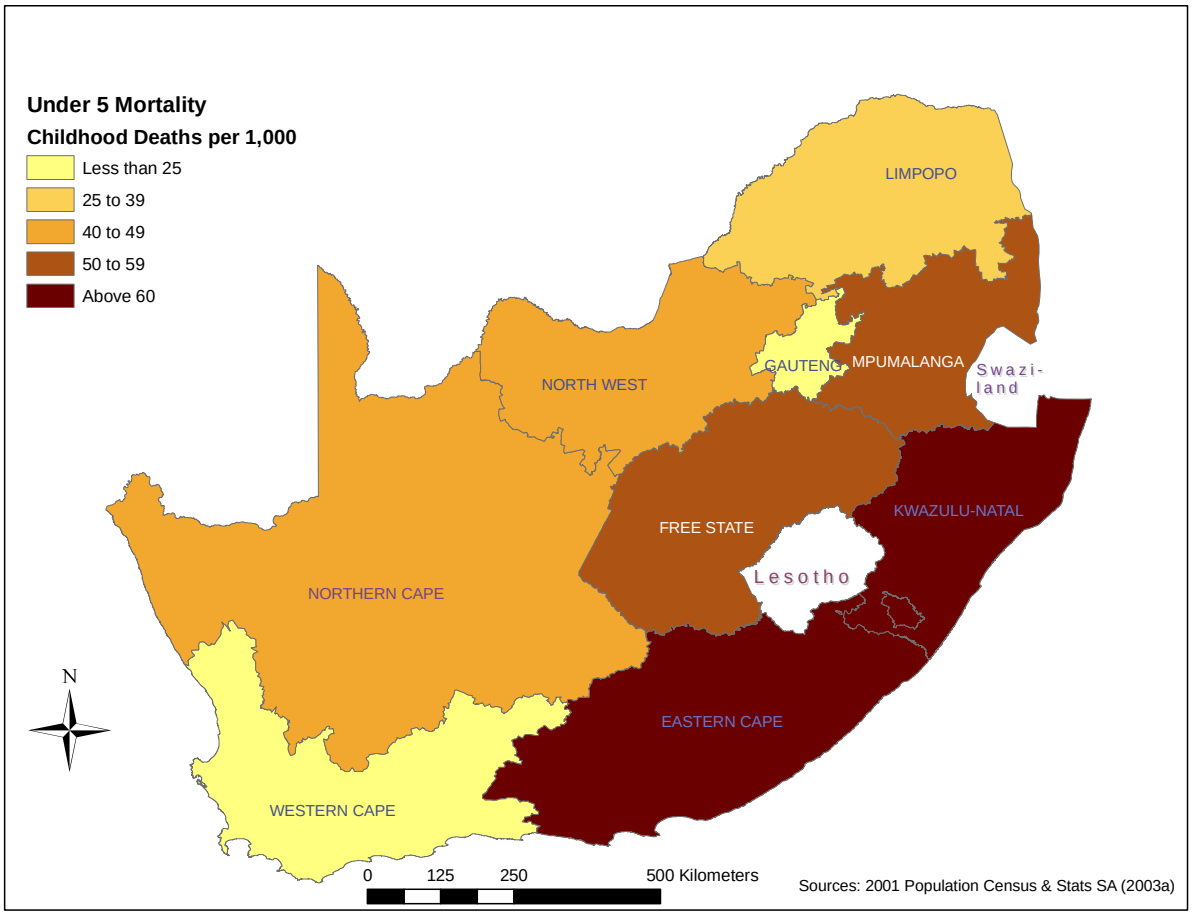
**Preliminary Findings**

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 ignore or mask considerable disparities in health that may exist within the population at different levels of geography.

Relative to the situation throughout most of Africa where levels of childhood mortality well in excess of 100 per 1000 are still common, the probability of a newborn dying before age 5 in South Africa is typically below 10% by national standard. However, there are several segments of the population where childhood deaths are typically in the excess of 10% like the case in most parts of Sub Sahara Africa. By Province, the estimated under-five mortality rate (U5MR) ranges from a low of 19 deaths per 1,000 births in Western Cape to a high of 66 deaths per 1,000 in Eastern Cape. For KwaZulu-Natal, it is estimated at 62 deaths per 1,000. Child deaths are typically in the excess of 50 per 1,000 in four of the nine provinces. In relative terms therefore, childhood mortality is at least 80% higher in Eastern Cape and KwaZulu-Natal than in Limpopo. It is 2.6 times and over 3 times higher than what obtains in Gauteng and Western Cape respectively. The

North West, Northern Cape and to some extent, the Free State and Mpumalanga provinces can be termed moderate child health achievers by national standards.

**Figure 1: Probability of dying before age 5 by Province**

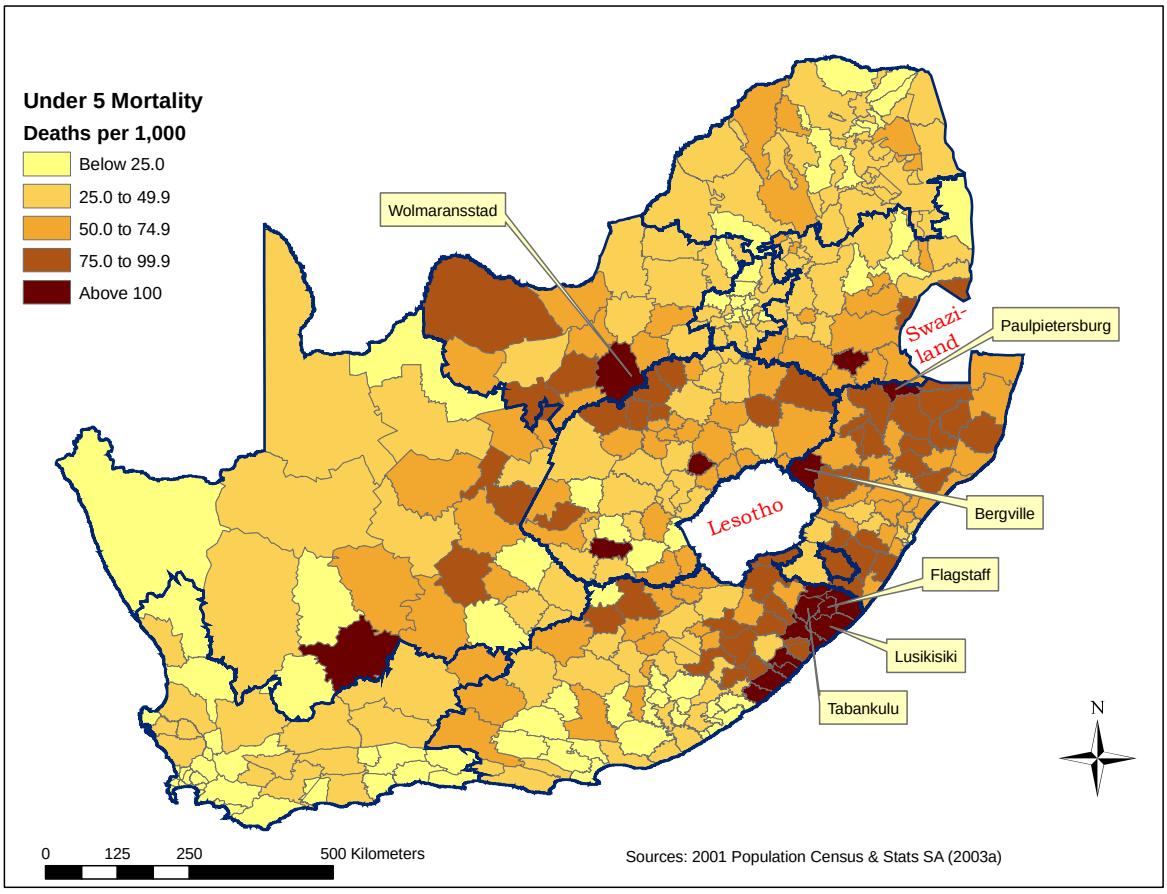



At the level of the MDs, estimated probability of dying before age five ranges from a low of below 1% (6-8 deaths per 1000) in Simonstown and Wynberg (Western Cape Province) to a high of 14% (138 and 139 deaths per 1000) in Lusikisiki and Tabankulu respectively; all located in the Eastern Cape Province. In terms of population size, Simonstown is of the same magnitude as Tabankulu and Lusikisiki with well over 100,000 inhabitants. The estimated population of Wynnberg was over 344,000 in 2001. Table 1 shows the MDs with the lowest levels of childhood mortality MDs (U5MR of below 15 deaths per 1000 births) and the top high mortality districts (U5MR in excess 110 deaths per 1000).

Statistically, Eastern Cape stand out with the highest mortality level in the country and as it turns out (Figures 1 and 2); this is entirely attributable to a cluster of high mortality

districts. In effect, it is this province that we observe the highest disparities in mortality levels among the MDs. In terms of low–high disparities within the province, the absolute difference is 12.5% while the relative difference (relative risk) suggests that children born in Tabankulu district are 10 times more likely to die before their fifth birthday than those born in Albany district within the same province (Table 2). It is also interesting to note that while Western Cape stands out as the province with typically lowest mortality, there are wide disparities among the MD within this province. For instance, the mortality level in the high mortality district (Beaufort West) is almost 9 times higher than in the lowest mortality district (Simonstown). The disparities (difference low-high) among districts within the province are relatively minimal for Gauteng and Limpopo (both in absolute and relative terms).

**Figure 2: Probability of dying before age 5 by Magisterial District**




For an idea on how the mortality levels among the districts may be connected with the relative economic positions of the district, we have compared the mortality estimates with the average monthly household expenditures imputed by Stats SA (2000). We observe

that most of the MDs with high child mortality are among the poorest (with average monthly expenditures at least below the provincial value) and most of low mortality districts have at least close to or above provincial average. However, there are several cases of poor (less economically endowed) districts where children experience the best survival chances and highly endowed districts where children are less likely to survive to age 5.

**Table 1: Estimated levels for the lowest mortality MDs and the highest mortality MDs**

| *Low Mortality Levels (<15 deaths per 1,000)* | | | *High Mortality (above 110 deaths per 1,000)* | | |
|---|---|---|---|---|---|
| *Magisterial District* | *Province* | *Q5* | *Magisterial District* | *Province* | *Q5* |
| Simonstown | WC | 5.6 | Tabankulu | EC | 139.3 |
| Wynberg | WC | 8.1 | Lusikisiki | EC | 138.1 |
| Mossel Bay | WC | 9.8 | Bizana | EC | 128.7 |
| Strand | WC | 10.6 | Flagstaff | EC | 127.9 |
| Paarl | WC | 12.6 | Libode | EC | 119.2 |
| Somerset West | WC | 12.8 | Mount Ayliff | EC | 114.4 |
| Randburg | GP | 12.9 | Port St Johns | EC | 114.2 |
| Pretoria | GP | 13.4 | Elliotdale | EC | 112.4 |
| Bellville | WC | 13.4 | Willowvale | EC | 111.7 |
| Stellenbosch | WC | 14.0 | Bergville | KZN | 109.6 |
| Albany | EC | 14.0 | Mqanduli | EC | 109.6 |
| Chatsworth | KZN | 14.9 | Wolmaransstad | NW | 108.5 |
| Goodwood | WC | 15.0 | Kentani | EC | 108.5 |

*Notes:* EC (Eastern Cape), GP (Gauteng), KZN (KwaZulu-Natal), NW (North West), WC (Western Cape). The names of the MDs are as per the map shape files produced by Stats SA. The spelling for some of the districts seems to differ slightly from what appears in some official South African reports (e.g. Stats SA 2000).

**Table 2: Comparing disparities in child health between MDs within same province**

| | | *Best Health MD* | | *High Risk MD* | | *Disparities* | |
|---|---|---|---|---|---|---|---|
| *Province* | *Q5* | *Name* | *Q5* | *Name* | *Q5* | *Range* | *Ratio* |
| Western Cape | 18.87 | Simonstown | 5.65 | Beaufort West | 48.93 | 43.28 | 8.66 |
| Eastern Cape | 65.68 | Albany | 13.98 | Tabankulu | 139.28 | 125.30 | 9.96 |
| Northern Cape | 42.42 | Namakwaland | 20.96 | Hartswater | 91.35 | 70.39 | 4.36 |
| Free State | 52.95 | Thaba Nchu | 24.60 | Viljoenskroon | 96.53 | 71.93 | 3.92 |
| KwaZulu-Natal | 61.64 | Chatsworth | 14.93 | Bergville | 109.64 | 94.71 | 7.34 |
| North West | 44.93 | Ga-Rankuwa | 22.56 | Wolmaransstad | 108.50 | 85.94 | 4.81 |
| Gauteng | 24.39 | Randburg | 12.95 | Nigel | 40.05 | 27.10 | 3.09 |
| Mpumalanga | 51.00 | Pilgrim's Rest | 11.69 | Nkomazi | 83.84 | 72.15 | 7.17 |
| Limpopo | 35.04 | Vuwani | 16.20 | Giyani | 56.30 | 40.10 | 3.48 |

Source: Computations based on the 2001 Census

## Discussion and Conclusions

Our preliminary findings suggest that the high level of child deaths in the Eastern Cape Province can be substantially reduced by paying more attention to the situation within a small cluster of MDs where child deaths are typically in excess of 100 per 1000. In the case of KwaZulu-Natal which is next in rank of high child deaths, a more uniform policy or general attention to all the MDs may be required to reduce the frequency of child deaths.

## References


Ahmad, O.B., A.D. Lopez, and M. Inoue. 2000. "The Decline in Child Mortality: A Reappraisal." *Bulletin of the World Health Organization* 78(10):1175-1191.

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.

Gwatkin, D.R., M. Guillot, and P. Heuveline 1999. "The Burden of Disease among the Global Poor." *The Lancet* 354: 586-589.

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

Hill, A. 1993. "Trends in childhood mortality," in *Demographic Change in sub-Saharan Africa.* National Research Council, Washington, DC: National Academic Press, pp. 153-217.

Murray, CJL. and A.D Lopez 1997. "Mortality by Cause for Eight Regions of the World: Global Burden of Disease Study". *The Lancet* Vol. 349: 1269-1276.

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.

Walker, N. B. Schwartlander, and J. Bryce. 2002. "Meeting International Goals in Child Survival and HIV/AIDS." *The Lancet* 360:284-89.

Wilmoth, J.R. 2000. "Demography of longevity: Past, Present and Future Trends." *Experimental Gerontology* 35(9):1111-1129.

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

Zuberi, T., A. Sibanda, A. Bawah and A. Noumbissi. 2003. "Population and African society," *Annual Review of Sociology* 29: 465-486.