Spatial Differentials in Childhood Mortality in South Africa: Evidence from the 2001 Census

Martin W Bangha and Sandile Simelane
University of Pennsylvania
3718 Locust Walk, Philadelphia PA 19104

ABSTRACT

This study examines spatial differentials in childhood mortality in South Africa using data from the 2001 population census. Of the complex routes of geographical area hierarchy maintained by South Africa, one route links provinces to Magisterial Districts (MDs). There are in all 354 MDs and nine provinces. Our analyses are conducted mainly at the level of MDs. The results show that provincial level indicators mask huge disparities in child health experienced by certain segments of the population. Children born in MDs such as Tabankulu, Lusikisiki, Bizana, Flagstaff, Libode and in the Eastern Cape Province in general are the most threatened early in life. Under prevailing mortality conditions, more than 10% of the children born in these districts are unlikely to celebrate their fifth anniversary. Most of the high mortality MDs form clusters that sometimes cut across provincial boundary. As it is to be expected, most of these high risk districts are among the poorest in the country as measured by average monthly expenditure. However, the worse-off districts, health-wise, are not necessarily the poorest and similarly, the best child health achievers are not necessarily the most economically well-off. On the basis of these findings, implementing policies targeting such high risk districts would seem a more rational way to help close the within-country disparities in child mortality and thereby speed up progress toward the MDGs target.

Keywords: Spatial differentials, childhood mortality, child health, population density, infectious diseases, census

Acknowledgements:
This research was done as part of the African Census Analysis Project (ACAP) which in collaboration with Statistics South Africa (STATS SA) provided the data for this analysis. ACAP was supported by grants from the Fogarty International Center (TW00004), National Institute of Child Health and Human Development (TW00655-04), Rockefeller Foundation (RF 97013 #21; RF 98014 #22), and Andrew W. Mellon Foundation.

Introduction

The dramatic improvement in mortality over the last few decades has resulted in widespread extension of human longevity beyond past predicted levels in most developing countries. Global estimates 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). 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.[1] 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). As a result, recent years have seen attempts at refocusing 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 (see Hill 1993; Dept of Health 1999; Rutstein 2000; Zuberi *et al.* 2003). Infant and childhood mortality, which started declining in most African countries following the Second World War (WWII) through the 1960s and 1970s began to show signs of stagnation or reversal by the late 1980s. This trend, incidentally linked to the poor performance of most African economies is compounded by the continued prominence of infectious diseases and the emergence of new infections like HIV/AIDS. The trend in stagnation or reversal is not uniform across countries or localities and population groups. Wide disparities exist among and within groups even in the

[1] The most frequently encountered communicable diseases among the under 5-year olds include perinatal conditions, malnutrition and nutritional deficiencies, infectious and parasitic diseases like intestinal infections, typhoid, acute respiratory infections, malaria, meningitis and meningococcal infections. Frequently observed non-communicable diseases include malignant neoplasm, diabetes mellitus, cerebrovascular
disorders and diseases of the circulatory system. For 1996 South Africa (see WHO mortality database at http://www3.who.int/whosis/mort), Death registration data suggest that infectious and parasitic diseases accounted for about 13% of all recorded deaths while malignant neoplasms (cancer) and diseases of the circulatory system accounted for about 9% and 21% of the deaths respectively.

same country. The latter raises the issue of mortality concentration within particular communities, families and/or specific levels of geography. Some studies have demonstrated a clear propensity for certain women to experience death of several kids even in areas where most women lose none (Das Gupta 1997; Madise and Diamond 1995). As such global estimates have been accused of frequently masking the "unfinished health agenda" in many countries. This study contributes to this debate by combining the visual tool of spatial analysis with the power and great potential offered by census data to investigate within-country geographic disparities in child health in South Africa.

Almost 3 decades ago in Alma-Ata, African delegates along with 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). The accompanying Millennium Development Goals (MDGs) are the current priorities of all member countries and commit 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. Following from this goal is target 5 that recommends a reduction by two-thirds between 1990 and 2015. Unlike the Alma Ata declaration, the MDGs have mainly emphasized global level results for monitoring progress than the reduction in gross disparities. In this study, we undertake childhood mortality mapping in South Africa to highlight concentration at lower levels of geography that in turn underscores the ineffectiveness of global indicators for monitoring progress in health achievement under the current strategy. 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 but they constitute an inappropriate guide for refocusing health priorities.

Background

South Africa is unique and distinct in several aspects. Coupled with its complicated historical regime of apartheid that has been the focus of international discourse, it remains in focus as the most economically advanced country in Sub-Saharan Africa and presents a remarkable paradox of demographic extremes. Zuberi *et al.* (2005) provide a comprehensive demographic picture of the immediate post-apartheid South Africa. While there is some amount of uncertainty as to the exact levels of mortality and fertility due to its complicated history and the considerable divergent results from the various studies, there seems to be a 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.

On one hand, South Africa has the lowest fertility in sub-Saharan Africa with levels close to replacement for most segments of the population. Estimates based on the 1996 census (Udjo 2005a; Sibanda and Zuberi, 2005) and on the 1998 Demographic and Health Survey (Dept of Health 1999) show a total fertility rate of about 3.0 children for the entire country, varying within a narrow range from a low of about 1.9 among whites to about 3.1 children among the African women. At the other end of the spectrum, recent evidence not only show signs of mortality reversal but equally suggest that it may be having some of the worst mortality indicators in Africa to the extent of suggesting that many African countries at independence (1960s) were safer and healthier than South Africa of late (Udjo 2005b). Based on the 1998 DHS the under-five mortality rate (the probability of dying before age 5) is estimated at 59 per 1,000 live births for the 5 year period preceding the survey and at 55 per 1,000 for the period 5-9 years preceding the survey. For the 10 year period to survey the rate varies from a low of below 20 among whites to 63 per 1,000 (Dept of Health 1999). Udjo (2005b) compares mortality data from the 1996 census with the 1995 and 1998 October Household Surveys (OHS) to suggest that childhood mortality levels may have increased during the 1990s across all population groups. Data from other sources (see Bah 2005; Dept of Health 1999) and especially official life tables seem to confirm this trend suggesting that mortality declined steadily prior to the late 1980s and leveled-off (or even increased thereafter). Besides, South Africa also faces some of the

world's record high HIV/AIDS prevalence rates. Currently available data on HIV prevalence among pregnant women in capital cities of 26 sub Saharan African countries show HIV prevalence reaching 32% in South Africa (UN/DESA 2005).

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 policies of the apartheid 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 2005b), they tend to ignore or mask considerable disparities in health that may exist within the population at different levels of geography. It is expected and normally is the case that, even within the region or province reportedly exhibiting the worst health outcomes, there will be isolated patches of lower geography that enjoy relatively better health. Similarly, even in the regions that enjoy better health outcomes, there are patches of worse health concentration. Health planning and intervention based on only global or regional level indicator will therefore be inefficient and a poor allocation of scarce resources. It is therefore necessary to identify such patches so that health intervention programs can be better targeted for the betterment of the population.

Objectives

GIS is a powerful visual tool that allows the application of disease mapping and the spatial analysis of clusters or clustering. The aim of this study is to document the spatial distribution of childhood mortality and to highlight any evidence of mortality concentration among geographic localities in South Africa. Combining GIS spatial analysis with the great potential offered by census data allows for analysis way beyond the level of geography frequently considered in most studies: the localization of childhood mortality to the Magisterial District (MD) level and to quantify the magnitude of inequalities in childhood mortality. Identification of high risk MDs where children are subject to increased risk of dying is important so as to guide health planners and policy makers in the effective use of scarce resources by targeting intervention programs on such high risk communities. It is also important for future research as it will map out the healthy and

unhealthy districts for children and hence, better focused in-depth health studies can be undertaken to assess the situation and identify the main factors responsible for the poor-health in such areas.

Data and methods

Data and unit of analysis:

Data for this study come from the 30 percent micro-data of the 2001 population census of South Africa archived by the African Census Analysis Project (ACAP) at the University of Pennsylvania. This is the second-ever nationwide headcount of the population of South Africa following the collapse of the apartheid regime in the early 1990s. The lowest possible analytical unit corresponding to the local administrative geography of South Africa consists of Magisterial Districts (MDs). MDs in turn consist of municipalities, wards, villages etc and fall within boundaries of one province. There are in all 354 MDs and 9 provinces namely; Eastern Cape, Free State, Gauteng, KwaZulu-Natal, Limpopo—formerly the Northern Province, Mpumalanga, Northern Cape, and Western Cape. Our analyses are conducted mainly at the level of the MDs. We use map shape files for the provinces and MDs corresponding to the 2001 and 1996 census geography produced by Stats SA (2003a) that are available at ACAP. We define the shape files as geographic using the WGS 1984 Datum and adopted the Africa Albers Equal Conic Area System for projecting the final maps. These options are available in the ArcGIS software that we use.

Mortality estimation:

Our focus here is on early childhood mortality. There are two main categories of methods for estimating infant and child mortality rates; the direct and indirect methods. Direct methods require data on dates of birth of children, survival status at a particular reference point and ages at death or dates of death for the deceased. Based on this information, it is possible to compute the age specific death rates at each age interval and hence estimate the probabilities of dying and/or survival to certain exact ages. An operational vital registration system covering at least 90% of all vital events should provide these necessary data. But vital registration systems are generally deficient in

most developing countries and African in particular.[2] The alternative is indirect methods that use data commonly collected in censuses and surveys. Basically they require data from Brass-type questions[3] on children ever born (CEB) and children surviving to women by reproductive age. The basic form of the estimation equation proposed by Brass (UN 1983) is:

$$Q(x) = k(i)D(i)$$

where D(i) denotes the proportion dead among children ever born to women in successive 5-year age groups, k(i) is the multiplier meant to adjust for non-mortality factors determining the value of D(i). Q(x), the measure of mortality (expressed per 1000 live births), is the probability that a child born in a specified year will die before reaching exact age x if subjected to prevailing mortality conditions.

In demographic analysis of mortality, we typically use Q1, Q2, and Q5 as the conventional measure of infant, child and childhood mortality. For this analysis, we estimate and map Q5 (under-five mortality) which seems to be more stable and has been observed to be a good measure of childhood mortality. It is also known to be a good indicator of development. However, we must note that from a public health point of view and epidemiologic utility, it would have made more sense and logic to extend this mapping of the spatial distribution of mortality to some major specific causes. But as mentioned previously, data on causes of death are much more difficult to obtain than information on vital events.

Results

Spatial population composition

Health and demographic literature suggests that children are highly sensitive to environmental hazards at the early stages of life. Once a child survives the first few hazardous years of life, s/he tends

[2] Though South Africa has a relatively functional vital registration system by African standards, coverage is still incomplete. Besides, it will be difficult to have this information tabulated by MDs.

[3] Named after William Brass (1975) who was the first to develop the procedure for converting proportions dead of children ever born reported by women in 5-year age groups into estimates of probability of dying before certain exact childhood ages.

to acquire some level of immunity to these environment influences and hence look forward to many more additional years of life than would be the case at birth (see Preston *et al.* 2001). Moreover, infectious diseases are commonly prevalent in infancy and tend to spread more easily in densely populated than the sparsely populated areas. Initially, we had thought that population density[4] might be somewhat related to childhood mortality. However, it appears to have little effect. Whatever the case, population of the districts remains an important factor in the interpretation of the results. The Northern Cape Province with close to a third of South Africa's total land area holds barely 2% of the population. Each of Gauteng and KwaZulu-Natal provinces comprises over 10 times the size of Northern Cape. By MD, only those containing the major cities stand out with densities exceeding 200 persons per square km. Northern Cape is pretty vast and sparse. The population sizes of the MDs range from a low of 2,750 persons in Fraserburg (Northern Cape) to a high of over 750,000 in the Johannesburg, Soweto, and Pretoria MDs in Gauteng and Inanda in KwaZulu-Natal. In terms of density, Umlazi in KwaZulu-Natal and Soweto have record high densities of over 6,000 persons per sq. km and Mitchell's Plains (Western Cape) following with 4,700 persons per sq. km. Durban and Johannesburg are ninth and tenth respectively with about 1,750 and 1,650 persons per sq. km. In terms of racial composition, Limpopo, Mpumalanga and North West are completely African with over 90% of the population each. However, Northern Cape and Western Cape are the only two provinces where Africans are in minority. The two provinces are predominantly Colored and Whites (see Stats SA 2003b).

Childhood mortality distribution

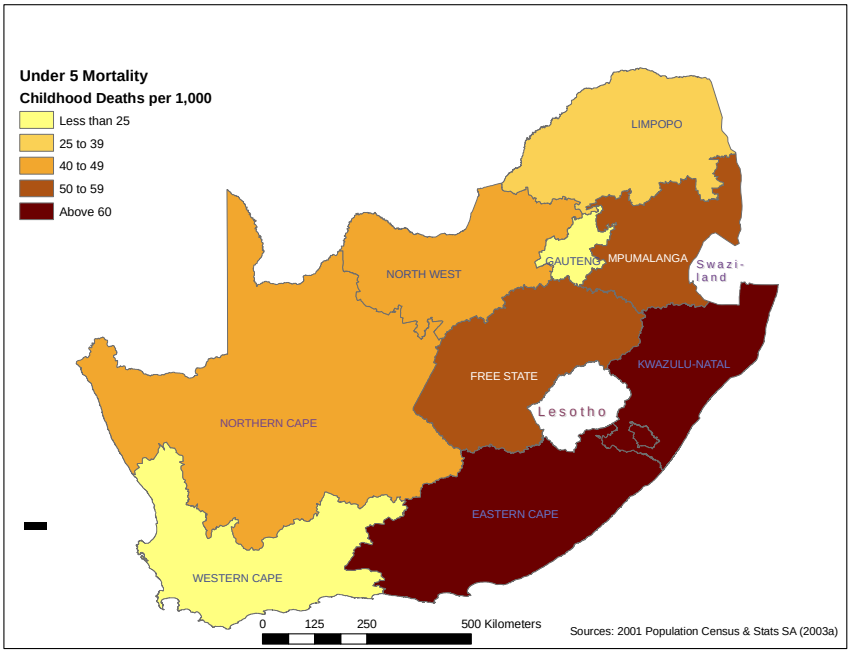
The mortality estimates suggest that Eastern Cape and KwaZulu-Natal provinces offers relatively little chances for child survival while Western Cape, Gauteng and Limpopo to some extent are the best health achievers.[5] The estimated under-five mortality rate

[4] As indicated previously, data used comes from the 30 per cent random sample of the 2001 census of South Africa. In order to have realistic estimates of the population sizes for the MDs and provinces for this analysis, we have weighted the sample figure by a ratio of 100 to 30. Moreover in the analysis, discussion, tables and highlights, we focus essentially on MDs with population sizes of above 30,000 as enumerated in 2001.

[5] The health achiever as referred to in this paper is based solely on the ranking of childhood mortality quotient irrespective of their performance in any other health indicator.

(U5MR or probability of dying before age five) 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. The estimate for KwaZulu-Natal is 62 deaths per 1,000. In all, the probability exceeds 50 deaths per 1,000 for 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. Figure 1 presents the estimated results. North West, Northern Cape and to an extent, Free State and Mpumalanga can be termed moderate child health achievers by national standards.

Figure 1: Probability of dying before age 5 by Province



Turning to the level of MDs, Eastern Cape's position is confirmed as the worst child health achiever. Estimates for probability of dying before reaching age five ranges from a low of about 6-8 deaths per thousand in Simonstown and Wynberg (Western Cape

Province) to a high of 138 and 139 deaths per thousand births 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. The estimated population of Wynnberg is over 344,000 in 2001. Two striking observations here: there is preliminary evidence of poor child health concentration in certain MDs. We observe from Figure 2 that almost all the ten MDs topping the chart of worst child health achievers are located not only in the same province (Eastern Cape) but are virtually in close proximity. The map equally shows that some of the MDs that qualify for best child health achievers can also be traced to this province and are sometimes even located next door to the worst health MDs. Similarly, high mortality MDs can also be spotted in the other provinces.

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

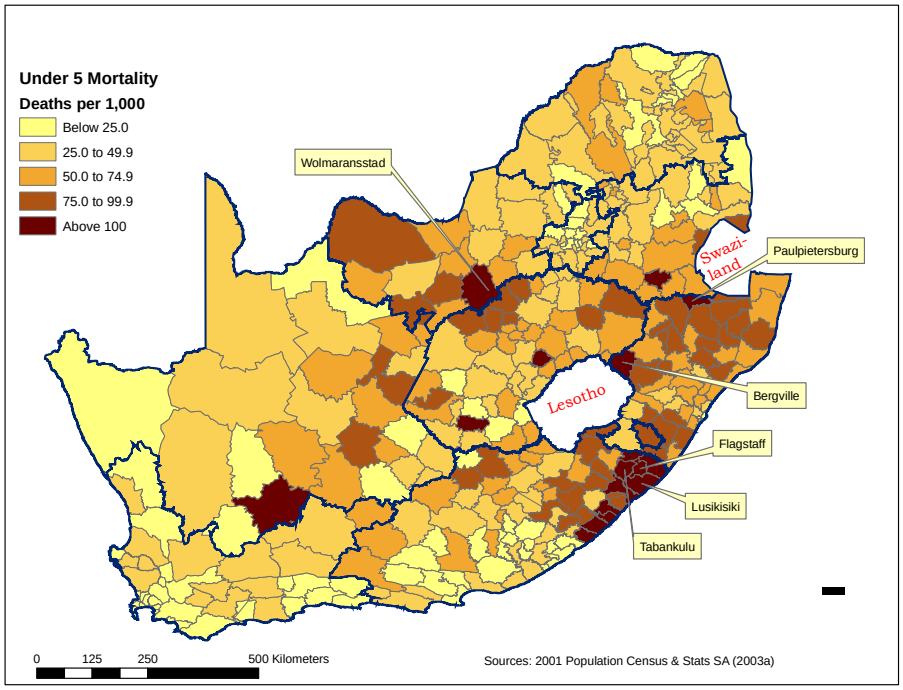


Table 1 compares the mortality rates of the best child health achievers (low U5MR of about 15 deaths per 1000 births) and that of the worse-off districts (high U5MR of over 110 deaths per 1000 births).

As noted, most of the best health performers are MDs located in the Western Cape Province. However, for the MDs with population sizes about 30, 000, the childhood mortality rate for the worse-off MD relative to the provincial average ranges from a ratio of 1.6 in Gauteng, Limpopo and Mpumalanga through 1.8 in the North West and Free State to a high of about 2.6 in Western Cape.

Table 1: Estimated mortality rates for top best health MDs and the record worst-off MDs

Best child health achievers (<15 deaths per 1,000)			*Worst child health (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 however, may differ slightly from those presented in other official reports consulted (e.g. Stats SA 2000).

Ignoring this national level comparison, we also observe wide disparities in child health among MDs within the same province and in some cases these disparities are disturbingly wide compared to neighboring MDs. There are simple indices proposed for measuring the magnitude of inequalities in health. In Table 2, we use two simple measures of disparities to emphasize the magnitude of the difference between the best health performers and the worse-off MDs within the same province. These consist of the simple difference between the two

extremes (range) and the rate ratios (considered as the relative risk). The disparities between the healthiest and worse-off MD as measured by simple difference is relatively minimal for Gauteng, Limpopo, and Western Cape province (less than 50 deaths per 1000). As measured by relative risk, the disparities are minimal for Gauteng and Limpopo (less than 3.5), moderate for Free State, Northern Cape and North West Province where a child taken randomly in the worse-off MDs is about 4-5 times more likely to die before age 5 than his/her counterpart in the best child health MD within the same province. The relative risk ratio is considerably high (above 7) for Mpumalanga, KwazuluNatal, Western, Cape and Eastern Cape; almost approaching double digits for the last two. For Western Cape which houses most of the districts rated as best health achievers, these results underscores the existence of a disturbingly high disparity between the worse-off and the best child health performer. For instance, a child born in Beaufort West, under prevailing mortality conditions has nine times the chances of dying during early childhood than his or her counterpart born in Simonstown.

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

Socio-economic aspects of the mortality concentration

There is a wealth of scientific evidence pointing to the pervasiveness of socio-economic gradient in health (see Marmot 2002) both between and within countries. Generally, the relationship between socio-economic status (SES) and health outcomes is observed to be inverse, with morbidity and mortality concentrated in those at the lowest spectrum of the socio-economic ladder. In a country like South Africa with a long history of widespread social stratification[6], it will sound logical to relate any observable morbidity and mortality differentials to socio-economic inequalities among communities. Income is the most commonly mentioned measure of SES but difficulties in obtaining accurate data on income have resulted in the frequent used of numerous proxies like household expenditure, household assets, education and employment. A review of the income data collected in the census of South Africa, Stats SA (2000) concludes that the information collected understates the income or expenditure levels of households.

Comparing the mortality estimates with the average monthly household expenditures imputed by Stats SA (2000), we observe that most of the high childhood mortality MDs are among the poorest (at least below average) and most of best health achievers have at least close to or above provincial average. Table 3 presents these imputed average monthly household expenditures for the top best health and high risk MD by province. The table shows that all the MDs with high childhood mortality had monthly household expenditures below the provincial average but not all the best health MDs were above the provincial average. For instance, the best health achievers for Northern Cape, Free State, North West, Mpumalanga, and Limpopo equally had monthly expenditures below average. Furthermore for Free State and Limpopo, the top high risk MDs seem to be relatively well-off (economically) than the best health achiever. This may suggest that socio-economic disparities between the MDs are not the sole explanation since the best health achievers are not exactly at the top in terms of income. However, income disparity is definitely a contributory factor

[6] South Africa features among the countries that have recorded a significant increase in inequality from the 1950s to the 1990s. In a study by WIDER with a sample of 73 countries (Cornea and Court 2001), it was noted that South Africa was among the 15 developing countries whose income inequality escalated between the 1950s and the 1990s.

Table 3: Mean monthly household expenditure (in ZAR) for top best health MDs and the record worse-off MDs by Province

Provincial Expenditure Range			*Best Health MD*		*High Risk MD*	
Province	*Lowest*	*Highest*	*Name*	*Amount*	*Name*	*Amount*
Western Cape	2,065	5,878	Simonstown	5,159	Beaufort West	3,008
Eastern Cape	746	3,996	Albany	2,993	Tabankulu	797
Northern Cape	1,605	3,013	Namakwaland	2,309	Hartswater	2,165
Free State	807	3,077	Thaba Nchu	1,062	Viljoenskroon	1,384
KwaZulu-Natal	1,014	4,573	Chatsworth	3,992	Bergville	1,389
North West	1,146	3,715	Ga-Rankuwa	2,009	Wolmaransstad	1,875
Gauteng	2,083	6,841	Randburg	4,958	Nigel	3,676
Mpumalanga	1,417	4,523	Pilgrim's Rest	2,014	Nkomazi	1,489
Limpopo	1,300	7,577	Vuwani	1,520	Giyani	1,571

Notes: ZAR → South Africa Rand (exchange rate $1 US = ZAR 6.42 as at 2005-06 time of these computations)
Source: Stats SA (2000)

Discussion and Conclusion

To improve the health of any society, it is essential to raise the health of its less privileged members. Almost 3 decades ago, the famous Alma-Ata Declaration called attention to gross disparities in health and mortality. As a follow up to the partial achievement of Alma-Ata, one of the MDGs' eight goals focuses on reducing child mortality and particularly targets a reduction by two-thirds between 1990 and 2015. In this paper we combine the power and great potential offered by census data with the beauty of GIS to document childhood mortality concentration at lower levels of administrative geography (MDs) in South Africa. The results confirm that provincial or global level indicators mask wide disparities in adverse health conditions enjoyed by certain segments of the population. Even in provinces that qualify as best child health achievers, we find communities that are evidently high risks for children. The most interesting cases portrayed by the maps are dark spots (corresponding to worse-off MDs) that are immediately surrounded by healthy districts within close proximity. The results suggest that children born in Magisterial Districts such as Tabankulu, Lusikisiki, Bizana, Flagstaff, Libode and in the Eastern Cape in general are the most threatened early in life. Under current mortality conditions, more than 10% of the children born in these districts are unlikely to celebrate their fifth anniversary.

While these districts are also noted to be among poorest in the country as measured by the average monthly expenditure (Table 3), poverty may provide only a partial explanation for their poor health or the best child health achievement in other districts. The worse-off districts, health-wise, are not necessary the poorest and similarly, the best achievers are not necessary the most economically well off. A case in point is Limpopo for which most socio-economic indicators suggest as the poorest but which interestingly shows up in our analysis as one of the best health achievers. In effect, the percentage of active population unemployed, poverty rates, percent of population 20 and over with no schooling in Limpopo are among the highest in the country. However, for the districts where childhood mortality remains a major problem, it may be helpful to identify the leading causes of child deaths in these high risk areas. Availability of causes of death data will enhance the assessment of factors underlying the high risk. It also makes sense and intuitive logic for

health policies to target these districts and combining this with poverty alleviation program will obviously yield positive results.

Because the indicators for monitoring the MDGs are based mostly on available national sample surveys, it is difficult to compute and assess how progress with the indicator translates to better health at the lower level of geography in the country. Unfortunately, it is usually at these lower levels that inequalities tend to be apparent and sometime may reach alarming proportions as seen in this study. It is, therefore, important that census-taking be maintained more regularly and encouraged as part of the MDGs' assessment process since it provides the needed data for monitoring progress and especially facilitates computations of the basic health indicators at the lower level of geography. While recognizing the importance of regular census taking for this process, it is equally imperative that the efforts of ACAP and its partners—in conserving African censuses and encouraging further analysis—be supported and sustained

Based on these findings we also believe that MDGs should equally target for goal 4 the need for countries to reduce current within-country disparities in child health. Indeed, by our estimates, some of the MDs have already achieved child mortality levels equivalent to those obtained in developed countries. As such, monitoring the reduction in within-country disparities sounds more rational, and any progress in this direction will count towards saving more child deaths than would be the case of just reducing the global level by two-thirds. Just focusing on reducing these disparities could actually be a faster way of achieving the reduction in global level by two-thirds. In this light a similar baseline assessment of the spatial distribution of mortality in each of the member countries may also be in order so as to serve as basis for future comparison and assessment of progress in the MDGs.

References

Bah, S. 2005. "HIV/AIDS in Light of Death registration Data: In search of Elusive Estimates." In Zuberi et al. (eds.), *The Demography of South Africa*. M.E. Sharpe Publishers, New York: 120-159.

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.

Cornea, G.A. and J. Court 2001. *Inequality, Growth and Poverty in the Era of Globalization.* UN University/World Institute for Development Economics research (WIDER), Helsinki.

Das Gupta, M.1997. "Socioeconomic Status and Clustering of Child Deaths in Rural Punjab." *Population Studies* 51: 191-202.

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

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.

Madise, N.J. and I. Diamond 1995. "Determinants of Infant Mortality in Malawi: An Analysis to Control for Death Clustering within families." *Journal of Biosocial Sciences* 27: 93-106.

Marmot, M. 2002. "The influence of income on health: Views of an epidemiologist." *Health Affairs*, 31-46.

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.

Preston, S.H., P. Heuveline and M. Guillot. 2001. *Demography: Measuring and Modeling Population Processes.* Blackwell Publishers, Oxford.

Rutstein, SO. 2000. "Factors associated with trends in infant and child mortality in developing countries during the 1990s." *Bulletin of the World Health Organization* 78(10): 1256-1270.

Sibanda, A. and T. Zuberi 2005. "Age at First Birth" In Zuberi *et al.* (eds.), *The Demography of South Africa*. M.E. Sharpe Publishers, New York: 90-119.

Statistics South Africa (Stats SA) 2003a. *Census 2001: GIS Spatial Data*. Pretoria, South Africa

Statistics South Africa (Stats SA) 2003b. *Census 2001: Census in Brief*. Pretoria, South Africa

Statistics South Africa 2000. *Measuring Poverty in South Africa.* Pretoria, South Africa.

Udjo, E.O. 2005a. "Fertility Levels, Differentials, and Trends" In Zuberi et al. (eds.), *The Demography of South Africa*. M.E. Sharpe Publishers, New York: 90-119.

Udjo, E.O. 2005b. "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 1983. *Manual X: Indirect Techniques for Demographic Estimation*. New York.

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

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.

Zuberi, T., A. Sibanda and E. Udjo (eds.) 2005. *The Demography of South Africa*. M.E. Sharpe Publishers, New York.