Inequities in under-five child nutritional status in South Africa
What progress has been made?

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Abstract

Despite the emphasis given to poverty reduction in policy statements which has been matched by a substantial increase in social spending, headcount measures of money-metric poverty have shown little improvement since South Africa completed its transition to democracy in 2004. Instead the number of people below a national poverty line has increased while levels of inequality were higher in 2008 than at any time before. Alternative approaches to measuring well-being and inequality show a more positive trend. I use the 2008 National Income Dynamics Study (NIDS) to assess and quantify the magnitude of inequalities in under-five child malnutrition ascribable to economic status. We compare these results to those of Zere and McIntyre (2003) who use similar data collected in 1993. In both cases, household income, proxied by per capita household expenditure, was used as the indicator of socio-economic status. I find that stunting is still the most prevalent form of malnutrition in South Africa and the rate of stunting is continues to be the highest in the provinces in which there is the highest concentration of income poverty, the Eastern Cape and the Northern Province. However although pro-rich inequalities in the distribution of stunting and underweight persist, these have significantly declined since 1993. The vast differences in under-five child malnutrition based on income that characterised the period just prior to end of apartheid have reduced suggesting that pro-poor improvements in child welfare have taken place. Policies that may have contributed towards this include the Child Support Grant (CSG) introduced in 1998, as well as improved access to health care and improvements in the education of women. These gains are especially noteworthy in the face of high HIV/AIDS prevalence during this period although it must be acknowledged that these data are confined to the survivors and those children who were severely malnourished may have died.

1 Introduction

Despite the priority given to reducing poverty and inequality by successive governments since the end of the apartheid era in 1994, most studies continue to confirm that the incidence of income poverty continued to increase in South Africa between 1993 and 2000, and has declined only marginally since 2000 (Stats_SA 2002; Leibbrandt, Levinsohn et al. 2005; Ozler 2007; Leibbrandt, Woolard et al. 2010). The result has been an increase in the number of people categorised as poor between 1993 and 2008 by some 3.8 million with the increase being most striking in urban areas (Leibbrandt et al, 2010:35). This period has also seen a steady increase in levels of income inequality with the Gini Coefficient growing from 0.66 in 1993 to reach 0.70 in

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2008 when the mean income of the wealthiest decile in South Africa was around 145 times greater than that of the poorest decile.

Statistics such as these are often greeted with scepticism by government officials who point to substantial improvements in the coverage of social protection in South Africa, the provision of a range of free services often referred to as a 'social wage, and the growing allocation made by the national budget towards social services. As examples, the number of beneficiaries in receipt of social grants has risen from 2.9 million in 1994 and stood at 13.4 million people in 2009 while the value of these grants increased from 2.9 percent of GDP to reach 4.4 percent over the same period. Eighty percent of the elderly and 64 percent of children are estimated to now receive grants. In terms of service provision, Bhorat et al (2006) report that 15 million previously un-serviced people have been connected to a formal water supply since 1994 while access to electricity for lighting increased by almost 60 percent between 1993 and 2009 to reach 82 percent of all households. As for the social wage, Freidman and Bhengu (1991) provide estimates suggesting that the value of free or subsidised services was around R88 billion in 2004 or some R587 per household per month.

Measures of poverty that take account of the depth and severity of poverty lend support to the notion that there has been some decline in deprivation. The Poverty Gap has declined by 12.5 percent between 1993 and 2008 and Poverty Severity by 13.6 percent (Leibbrandt, 2010:35). Taken together, these figures suggest that simply estimating the share of the population below a poverty line does not do justice to the efforts of post-apartheid governments, and that over-reliance on money-metric measures may obscure both the progress made and the issues that require further attention. Focusing analysis more narrowly on children is both a worthwhile exercise in its own right, as well as a way of exploring alternatives to more conventional forms of poverty analysis.

Globally, about 60 million children experience moderate acute malnutrition, and further 13 million, severe acute malnutrition. Moreover, about a third of the 6 million preventable deaths of young children occurring in poor and middle-income countries each year have been ascribed to under-nutrition (Black, Allen et al. 2008). Of those that survive, an estimated 200 million children under 5 years fail to reach their potential in cognitive development because of poverty, poor health and nutrition, and deficient care (Grantham-McGregor, Cheung et al. 2007). This early childhood development has been shown to have a significant impact on an individual's adult health and life

prospects. Such "socioeconomic status gaps in child mortality (and morbidity) are not simply inequalities, they are also inequities – inequalities that are unjust and unfair" (Victora, Wagstaff et al. 2003).

Research in KwaZulu-Natal has demonstrated that stunted children do less well in their first few years at school than children who are an appropriate height for their age (Yamauchi 2008). It has also been shown that the reductions in household poverty that resulted from the introduction of the Child Support Grant produced substantial reductions in stunting of young children that are highly likely to produce, in turn, substantial increases in those children's productivity and wages once they grow up (Aguero, Carter et al. 2009). Improving our understanding of the changes in the nutritional status of children can potentially assist in better identification of policy interventions seeking to bring about a sustainable reduction of poverty in South Africa. In this paper I use data concerning child nutritional status collected in 2008 to provide better insight on what changes in socio-economic status have taken place in South Africa since the end of apartheid. I update the estimates of Zere and McIntyre (2003) based on an earlier national survey that collected similar data in 1993. As with Zere and McIntyre, our aim is to further develop the quantification of inequalities in health in South Africa, and the extent to which this has changed since 1994.

2 Method

The heights and weights of children and infants can be used to calculate anthropometric indices which can then be used investigate changes in individual nutritional status as well providing evidence of past growth failure (Cogill 2003). At the population level, such indicators can serve as a way assessing inequalities in terms of health status and, potentially, future productivity and earnings (Braveman 1998). Stunting, or low height-for-age (HAZ), results from failure to grow at an adequate rate and is usually a sign of prolonged (chronic) under-nutrition and/or repeated disease or illness. HAZ is generally considered to be a long term indicator of under-nutrition that reflects the cumulative effects of socio-economic, environmental, health and nutritional conditions. Wasting, or low weight-for-height (WHZ) is a short-term indicator that identifies children affected by current (acute) under-nutrition or recent illness, and is a strong predictor of child mortality. Low weight-for-age (WAZ) identifies children that are underweight for a specific age and reflects both chronic and/or acute under-nutrition. In this paper I will discuss all three, but will focus on stunting and wasting as being useful indicators of sub-optimal mental and physical

child development and, as a result of this, factors that predispose children to poorer health, lower earnings, and higher mortality later in life.

The first wave of the National Income Dynamics Study (NIDS) undertaken in 2008 is one of a handful of data sets available in South Africa that has collected the information required to calculate these indicators (Leibbrandt, Woolard et al. 2009). Moreover, NIDS provides detailed information on both the income and expenditure patterns of the 7302 households surveyed, which can be used to measure differences in socio-economic status (Argent 2009; Finn, Franklin et al. 2009). These data are readily comparable to those collected by the Project for Statistics on Living Standards and Development (PSLSD) in 1993, and to analysis undertaken by Zere and McIntyre (2003). Using very similar procedures, PSLSD also weighed and measured children and gathered detailed expenditure data from 8809 households

In line with many other studies, I measure inequalities in socio-economic status using household per capita expenditure (PCE), include the imputations proposed by Finn et al (2009) dealing with non-response and missing data, but exclude the imputed rent estimates to ensure comparability with the PSLDS[2]. To determine the incidence of poverty, I adopt the widely used poverty threshold proposed for South Africa by Ozler (2002) adjusted to 2008 prices which amounts to R515 per person per month. Turning to our measure of nutritional status, children's heights and weights are usually assessed against those of a reference population of children in good health. In this paper I use the WHO Child Growth Standards as the reference and calculate z-scores for the three anthropometric indicators for children in both surveys (WHO 2006). Stunted pre-school age children five years of age and below are defined as those whose height-for-age is more than 2 standard deviations below the median height of healthy children of the same age. Similarly, these children are categorised as wasted if their weight-for-height is more than 2 standard deviations below the median weight-for-height of healthy children. This also applies for under-weight children using weight-for-age. Values exceeding -6 or +6 standard deviations have been deemed implausible and have been excluded from our analysis.

Following Zere and McIntyre, I also make use of an illness concentration curves to depict changes in health inequalities between 1993 and 2008. Similar to the Lorenz curve used to depict income inequality, the illness concentration curve plots the cumulative proportions of children ranked by

[2] The recommended post-stratified weights for both surveys are used.

the household's socio-economic status against the cumulative proportions of malnutrition. I extend their analysis over time and by constructing a composite index of anthropometric failure proposed by Svedburg (2000) and applied by Nandy et al (2005) using the 1998/9 National Family Health Survey in India. This index combines HAZ, WAZ and WHZ that may underestimate the prevalence of under-nutrition if used independently, and identifies children that show nutritional deficiencies in more than one dimension. The index also has resonance with Alkire and Foster's (2009) equally weighted counting approach to multi-dimensional poverty.

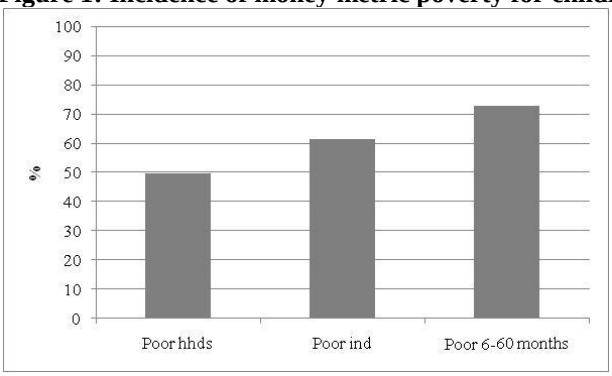
3 Analysis

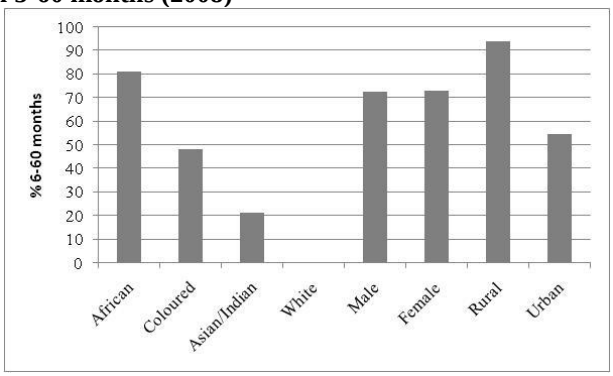
Compared to NIDS in which measurements for 83 percent of eligible children were collected, PSLDS was marginally more successful and managed to collect heights and weights for 86.5 percent of children aged from 6 to 60 months. However when applied to the reference population, data for 32 percent of those measured in 2008 had to be excluded as being implausible compared to just 16 percent of the 1993 group. This means that data on 2067 under-five children from NIDS can be compared to 3684 children in the PSLDS. These data are derived from 2686 households in 1993 that have children aged 6-60 months for whom complete anthropometric data were collected compared to 1611 households in 2008.[3]

Hall (2011) notes that children are more likely to be living in poor households than adults, and this is supported by the NIDS data which shows that almost 73 percent of children aged between 6 and 60 months are in poor households. This can be compared to just less than 50 percent of all households that are categorised as being poor As is also shown in Figure 1, there are however substantial differences in child poverty by race and geo-location, although not by sex.

[3] It is important to note that in 1993, 53 percent of households below the poverty line had children in this age band compared 21 percent of households above the poverty line. In 2008 this had fallen to 41 percent and 17 percent respectively.

Figure 1: Incidence of money metric poverty for children 5-60 months (2008)





Over 80 percent of African children aged 6 to 60 months are to be found in poor households compared to less than 1 percent of white children. While less dramatic, the differences between African, coloured and Indian children are nonetheless striking. An astounding 94 percent of rural children are living in poor households.

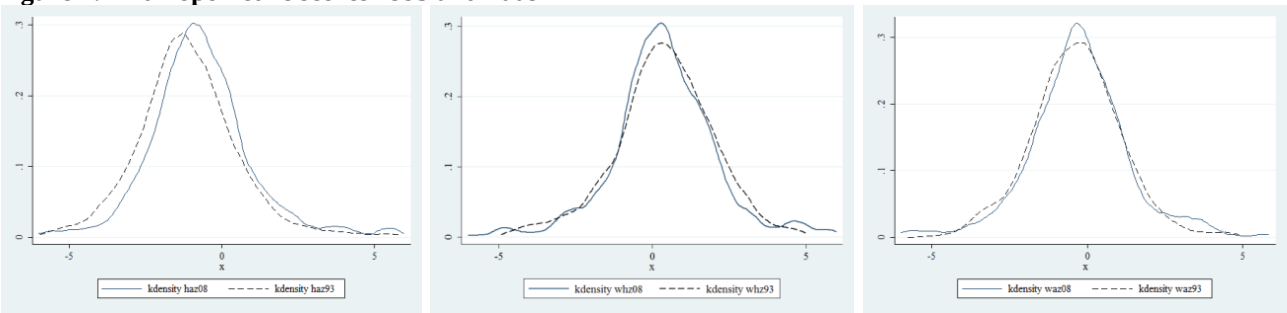
Table 1 compares the percentage of children that have HAZ, WHZ and WAZ scores which lie below two standard deviations below the reference child, and includes the percentage of children living in households in which per capita expenditure is below the poverty line. I also show the percentage of children that experience anthropometric failure in any one or combination of these dimensions as composite index of anthropometric failure (CIF).

Table 1: Incidence of stunting, wasting, underweight and poverty

Year	HAZ	WHZ	WAZ	Headcount	CIF
1993	21.1%	7.5%	12.6%	68.2%	39.9%
2008	17.8%	6.6%	11.9%	72.7%	25.1%

All forms of anthropometric failure were less frequent in 2008, and children who experienced one or more forms of failure had declines by almost 15 percentage points. This stands in contrast to the headcount of poverty for children in this age group which if anything, had modestly increased. Depicting the full distribution of the anthropometic scores in a kernel density graph allows these changes to be better visualised. This is shown in Figure 2.

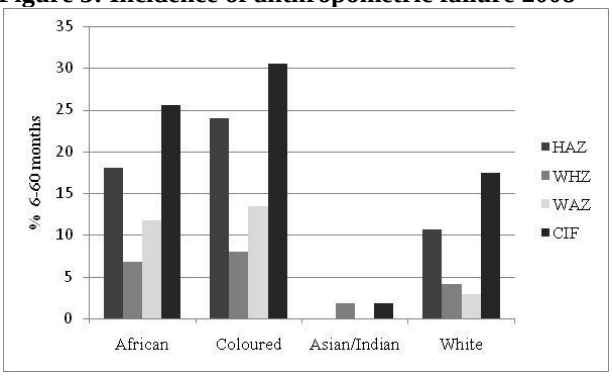
Figure 2: Anthropometric scores 1993 and 2008

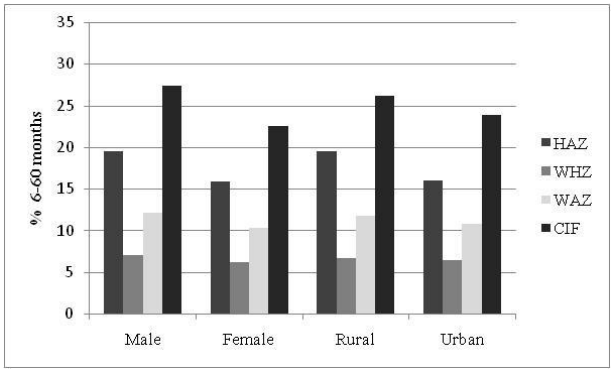


At -1.109, the mean *z* score for the HAZ of children in 1993 was significantly lower than that for children in 2008 at -0.676. The dashed line representing the 1993 data is flatter, wider and to the left of that for 2008. This reflects a greater concentration of children 6-60 months that are below the reference child in terms of their height for age and suggests that the severity of stunting was greater in this year. The peak in 2008 is slightly to the left of zero showing that the average child in the survey has a lower height for age than the reference child, but also that this has improved both in terms of the number of children in this position and in terms of their distance from the reference HAZ score. Finally the longer tail right of zero may be indicative of a greater tendency for taller and heavier children. This analysis is repeated for the WHZ and WAZ and shows similar although not as noteworthy shifts towards the reference child, and the mean *z* scores are significantly different only in the case of weight for age.

Figure 3 confirms that differences by race and location are evident in terms of each of the anthropometric measures.

Figure 3: Incidence of anthropometric failure 2008

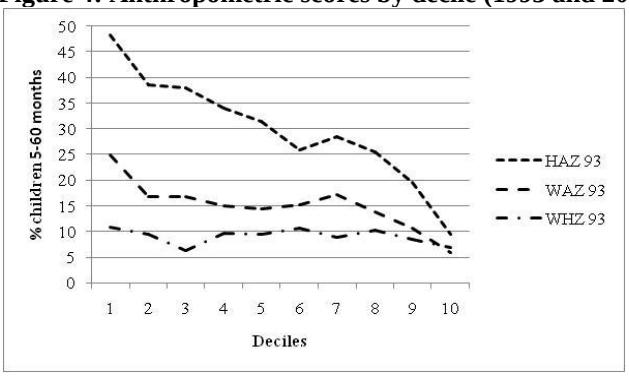


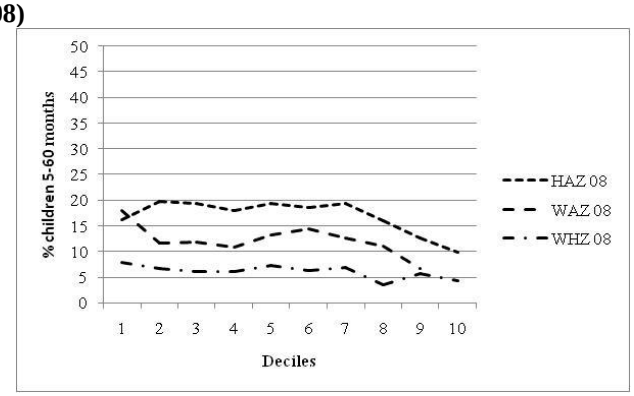


However, unlike the results showing money-metric poverty, African children are not most at risk of anthropometric failure and instead, coloured children have higher frequencies of stunting, wasting, under-weight and this is most especially evident in terms of the composite index. A larger percentage of children in rural areas experience all forms of anthropometric failure, although only in the case of stunting is this difference statistically different.

Figure 4 compares the percentage of children with z scores indicating the presence of stunting, wasting and underweight by income decile in 1993 and 2008. The result is striking. While the re-estimated results for 1993 match those reported by Zere and McIntyre using the earlier WHO standard, the results for 2008 depict a dramatic decline in inequality in terms of HAZ and to a lesser extent WHZ.

Figure 4: Anthropometric scores by decile (1993 and 2008)



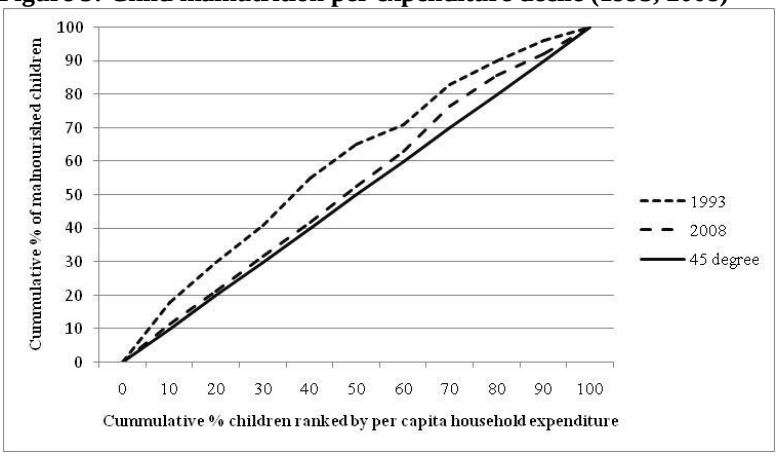


As would be anticipated, the re-estimated scores for 1993 match the earlier finding by Zere and McIntyre (2003) include the peaks in HAZ and WHZ that are found in around deciles 7 and 8. This confirms that these results are robust to changes in the reference child used when calculating the z scores. The results for 2008 show a dramatic improvement in terms of a decline in inequality

between children in different deciles in terms of nutrition outcomes. Among households in the poorest 70 percent of those that contain children, about 20 percent can be classified as stunted, which declines to 10 percent of those living in the top decile in terms of per capita expenditure. Wasting has declined from around 10 percent of children living in the bottom 80 percent of households to just over 5 percent for this group in 2008, while the percentage of under-weight children shows a similar decline both in the extent and slope of the distribution. This is in stark contrast to the 1993 findings in which children in the poorest decile had rates of stunting and wasting that are five and three times that of the richest decile.

Another way of depicting inequalities in terms of health outcomes including anthropometric status is to make use of illness concentration curves originally suggested by Wagstaff et al (1991), and later adopted by Zere and McIntyre (2003) to depict the South African situation in 1993. These plot cumulative proportions of children ranked by household expenditure in deciles, against the cumulative proportions of malnutrition and are shown in Figure 5 for 1993 and 2008.

Figure 5: Child malnutrition per expenditure decile (1993, 2008)



The extent of the reduction in health inequalities between 1993 and 2008 is striking with the 2008 line running close to the 45 degree line of equality.

A final consideration is that the impact of income on child malnutrition is being offset by other observable characteristics of the children, the households in which they live, or the location of these households in terms of geo-spatial location and province. To test for this, a logistic regression is estimated in which the determinants of nutritional outcomes (HAZ, WHZ, WAZ and the Compound Index of Anthropometric Failure or CIF) are simultaneously entered. In addition

to the standard demographic and spatial confounders, logged per capita expenditure (pce), an asset score and a durable goods score are included as alternative proxies for household wealth. These results are shown in Table 2 which reports the odds ratio for each of the different forms of anthropometric failure, and is highlighted in bold for results that are statistically significant at the 0.95 percent level.

Table 2: Determinants of child malnutrition

	HAZ	WHZ	WAZ	CIF
urban	0.912	1.446	1.177	1.146
wcape	1.260	1.006	**2.530**	1.076
ecape	**1.711**	0.776	**1.809**	**1.805**
ncape	**1.599**	1.232	**3.094**	**1.784**
freestate	1.127	2.941	**2.270**	**1.586**
mpum	0.833	**2.547**	1.339	1.186
limpopo	1.136	**3.086**	**2.712**	**2.084**
northwest	1.013	**2.888**	**3.297**	**1.432**
gauteng	1.314	**3.088**	**1.971**	1.497
african	1.383	0.640	**4.054**	1.585
coloured	1.727	2.089	**5.629**	1.928
indian	1.674	3.075	**22.477**	3.009
male	**1.233**	0.897	**1.579**	1.180
logpce	0.989	0.992	0.981	1.004
hhsize08	0.988	0.982	**1.022**	0.973
mother's education	**0.917**	0.908	**0.920**	**0.663**
asset score	0.979	**0.751**	**0.831**	0.985
durables score	0.928	0.897	1.159	**1.005**

Although some provinces are more likely than the reference province (KwaZulu-Natal) to experience anthropometric failures, and Indian children are far more likely to be under-weight compared to white children, per capita expenditure does not influence any of the measures of malnourishment. This confirms that the enormous gaps reported by Zere and McIntyre have disappeared and their appeal that appropriate policy responses be found appear to have been heard.

4 Conclusion

Based on data collected in 1993, Zere and McIntyre identified inequities in child outcomes based on race and income and called for social policies to be put in place to address these. Data collected in 2008 suggests that inequities at least in terms of income have been reduced. Fr0m this it appears

that something has worked, and available evidence points to the introduction of the Child Support Grant in 1998. This is supported by Aguero et al (2009) who made use of the three waves of the KIDS data to demonstrate a statistically significant and positive causal link between accessing the grant and the anthropometric status of children. Other forms of nutritional disorders may be emerging that may have equally serious consequences if not dealt with, notably obesity (Timaeus, 2011). In this instance, spending more money by increasing the grant, or extending the grant, may not be a solution and alternative policies to grants may have to be found.

Despite the positive result, the bulk of South Africa's children continue to live in households that are below the poverty line. As Hall (2011) demonstrates, children are more likely than adults to be found in households that are poor in terms of income, access to services and participation in the labour market. This means that while inequities in nutritional status may have largely been resolved with the existing suite of policies, children remain at risk in South Africa and other outcomes such as their education and successful transition into adulthood are still in jeopardy. To deal with this, further steps are required to address household level poverty including better service delivery to those areas in which children are living, the creation of economic opportunities for the adults with whom children are living, as well as the delivery of other forms of social protection to children.

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