The South African Index of Multiple Deprivation 2007 at Municipality Level

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[1] Strengthening Analytical Capacity for Evidence-based Decision-making.

Contents

1 Introduction

This report presents the South African Index of Multiple Deprivation 2007 (SAIMD 2007) at municipality level. The SAIMD 2007 is a composite index reflecting four dimensions of deprivation experienced by people in South Africa: income and material deprivation, employment deprivation, education deprivation, and living environment deprivation.

This project builds on several recent studies about deprivation in South Africa that have been undertaken by a team from the University of Oxford's Centre for the Analysis of South African Social Policy (CASASP). A team comprising members of CASASP, the Human Sciences Research Council (HSRC) and Statistics South Africa (StatsSA) developed a ward-level measure of multiple deprivation for each province in the country, called the Provincial Indices of Multiple Deprivation (PIMD) (Noble *et al.,* 2006, 2009 forthcoming). The PIMD refers to deprivation experienced by the total population (i.e. all ages including children) and was based on the 2001 Census.

Subsequently a South African Index of Multiple Deprivation (SAIMD) was produced at datazone level for 2001 for the whole of South Africa (Noble *et al.,* 2009). The datazones are small area level statistical geographical units (Avenell *et al,* 2009) and enabled a much more fine-grained analysis of deprivation to be developed for 2001.

In parallel, a South African Index of Multiple Deprivation for Children 2001 (SAIMDC 2001) was produced at municipality level using data from the publicly available ten percent sample of the 2001 Census (Barnes *et al.*, 2007; Barnes *et al.,* 2009), and was further developed at datazone level (Wright *et al.,* 2009).

The South African Index of Multiple Deprivation (SAIMD) 2007 that is presented in this report has been constructed using data from the 2007 Community Survey (Statistics South Africa, 2007). It is therefore a more up-to-date profile of deprivation across South Africa than has hitherto been produced. **Section 2** of this report presents the domains and indicators for the SAIMD 2007 and summarises the methodological approach that was used. **Section 3** provides an overview of the SAIMD 2007 at municipality level and **Section 4** explores the extent of change in the levels of deprivation between 2001 and 2007.

2 Methodology

The SAIMD 2007 was constructed on the basis of a model of deprivation comprising a series of uni-dimensional domains of deprivation which each contain one or more indicators relating to that domain of deprivation. The domains were each constructed as a separate domain index and then combined into a single measure of multiple deprivation – the SAIMD 2007.

The 2007 Community Survey (CS) was conducted in February 2007 and covered 274,348 dwelling units across all of the provinces, and attained a response rate of 93.9% (Statistics South Africa, 2007: 10-11). It was a nationally representative large-scale household survey intended to provide information about the profile of the South African population between the 2001 and 2011 Censuses.

With the exception of the Health Domain, the domains and constituent indicators included in the SAIMD 2007 are almost identical to those used for the datazone SAIMD 2001 (Noble *et al.,* 2009). Any differences are noted below, and were the result of slight changes in the wording of questions between the 2001 Census and the 2007 CS Survey or the absence of questions in the Community Survey that were present in the 2001 Census. The Health Domain in the SAIMD 2001 was a form of standardised mortality ratio (years of potential life lost). As the CS contained no mortality data, the 2001 Health Domain could not be replicated in the SAIMD 2007. The limited morbidity data contained in the CS was explored to see if an alternative Health Domain might be possible but as these data covered only a small subset of the population at risk it was decided not to construct a Health Domain on this basis and accordingly the SAIMD 2007 contains no Health Domain.

Four domains of deprivation were produced using the 2007 CS to form the SAIMD 2007:

- Income and Material Deprivation
- Employment Deprivation
- Education Deprivation
- Living Environment Deprivation

A total of 11 indicators were used in the SAIMD 2007. The intention was that the indicators should:

- be 'domain specific' and appropriate for the purpose (as direct as possible measures of that form of deprivation);
- measure major features of that deprivation (not conditions just experienced by a very small number of people or areas);
- be statistically robust.

The rest of this section provides information about the domains and their constituent indicators, as well as how the SAIMD 2007 was constructed. Appendix 1 contains further details about each of the indicators in terms of how they were constructed using the Community Survey data.

2.1   Income and Material Deprivation Domain

The purpose of this domain is to capture the proportion of the population experiencing income and/or material deprivation in a municipality.

- **Number of people living in a household that has a household income (need-adjusted using the modified OECD equivalence scale) that is below 40% of the mean equivalent household income (approximately R1003 per month in February 2007 Rands); or**
- **Number of people living in a household without a refrigerator; or**
- **Number of people living in a household with neither a television nor a radio.**

A simple proportion of people living in households experiencing one or more of the deprivations was calculated (i.e. the number of people living in a household with low income and/or without a refrigerator and/or without a television and radio divided by the total population).

2.2   Employment Deprivation Domain

The purpose of this domain is to measure the proportion of the working age population involuntarily excluded from employment in a municipality.

- **Number of people who are unemployed (using official definition); plus**
- **Number of people who are not working because of illness or disability.**

A simple proportion was calculated of adults aged 15-65 who were unemployed plus those who said they were too sick/disabled to work divided by the total economically active population aged 15-65 plus those not able to work due to sickness/disability.

2.3   Education Deprivation Domain

The focus for this measure is adults aged 18 to 65 years with no secondary schooling.

- **Number of adults (18-65 years) with no secondary schooling.**

This domain was calculated as a simple rate for 18-65 year olds.

2.4   Living Environment Deprivation Domain[2]

The purpose of this domain is to identify people living in poor quality environments.

- **Number of people living in a household without piped water inside their dwelling or yard[3]; or**
- **Number of people living in a household without a pit latrine with ventilation or flush toilet; or**
- **Number of people living in a household without use of electricity for lighting; or**
- **Number of people living in a shack; or**
- **Number of people living in a household that is crowded.**

A simple proportion of people living in households experiencing one or more of the deprivations was calculated (i.e. the number of people living in a household without piped water and/or without adequate toilet and/or without electricity for lighting and/or that is a shack and/or that is crowded divided by the total population).

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[2] This domain in the SAIMD 2001 additionally had an indicator measuring people in households without access to a telephone; this was not asked about in the same way in the CS and so the indicator was dropped.
[3] The equivalent indicator in SAIMD 2001 additionally captured people who had access to piped water within 200 metres of their dwelling – this was not asked in the CS and so was not included.

2.5 Constructing the SAIMD 2007

Once the domain scores had been created as described above, district management areas and municipalities containing less than a thousand people were deleted.

The domain indices were then standardised by ranking, and were transformed to an exponential distribution. The exponential distribution was selected for the following reasons. First, it transforms each domain so that they each have a common distribution, the same range and identical maximum/minimum value, so that when the domains are combined into a single index of multiple deprivation the (equal) weighting is explicit. Second, it is not affected by the size of the municipality's population. Third, it effectively spreads out the part of the distribution in which there is most interest, i.e. the most deprived municipalities in each domain. Each transformed domain has a range of 0 to 100, with a score of 100 for the most deprived municipality. The exponential transformation that was selected stretches out the most deprived 25% of municipalities in the country.

For the SAIMD 2007, equal weights were assigned to the exponentially transformed domains in the absence of evidence suggesting differential weights should be used.

The SAIMD 2007 score is therefore the (equally) weighted sum of the exponentially transformed domain rank of the domain scores. The larger the SAIMD score, the more deprived the municipality. However, because of the transformations applied, it is not possible to say, for example, that a municipality with a score of 44 is twice as deprived as a municipality with a score of 22. In order to make comparisons between municipalities using the SAIMD the municipality ranks should be used.

3 Deprivation in South Africa in 2007

The national picture

What are the levels of deprivation across South Africa as a whole in 2007? For all four domains it is possible to provide a simple percentage of people experiencing each type of deprivation:
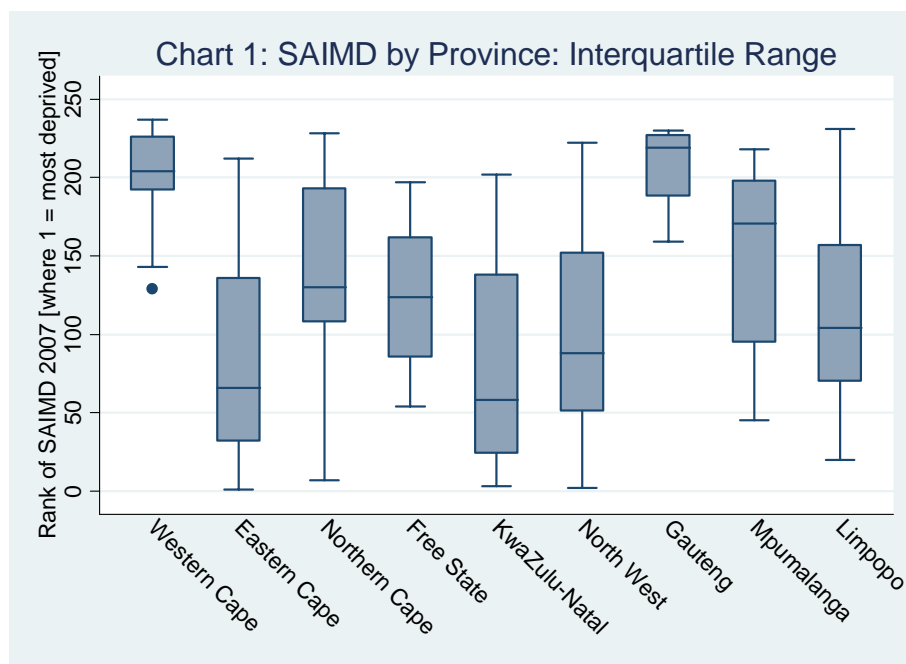
- 72% of people live in households that are income and/or materially deprived;
- 37.8% of the relevant working age population are unemployed or unable to work due to sickness/disability;
- 27.4% of the adult population aged 18-65 are education deprived (have no secondary schooling);
- 67.2% of the population experience living environment deprivation.

Deprivation at province level

Levels of deprivation vary greatly by province. **Chart 1** shows the interquartile range of the SAIMD 2007 ranks by province. In the chart the vertical line and end bars indicate the range of the SAIMD 2007 ranks of the municipalities in each province. The most deprived municipality in the country is ranked 1 and is in the Eastern Cape, and the least deprived municipality is ranked 237 and is in the Western Cape. The box for each province shows the range of the SAIMD 2007 ranks for the middle 50% of municipalities in the province (the interquartile range[4]), and the horizontal line within the box represents the rank of the median municipality within the province. If the box is relatively short this will indicate that municipalities are ranked in a narrow range, with similar SAIMD 2007 ranks (and therefore similar levels of deprivation). If this box sits towards the bottom of the chart it tells us that the SAIMD 2007 ranks of the municipalities in the province are concentrated in the most deprived part of the national distribution. If the box sits towards the top of the chart it tells us that ranks of the municipalities in the province are concentrated in the least deprived part of the national distribution.

For both the Western Cape and Gauteng, municipalities are tightly grouped in the least deprived part of the national distribution. On the other hand in the Eastern Cape, KwaZulu-Natal, North West and Limpopo provinces the municipalities tend to be ranked towards the deprived part of the distribution demonstrating much higher levels of deprivation in these provinces.

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[4] The interquartile range (IQR) is 'a measure of dispersion calculated by taking the difference between the first and third quartiles (that is, the 25th and 75th percentiles). In short, the IQR is the middle half of a distribution' (Vogt, 1999: 143).
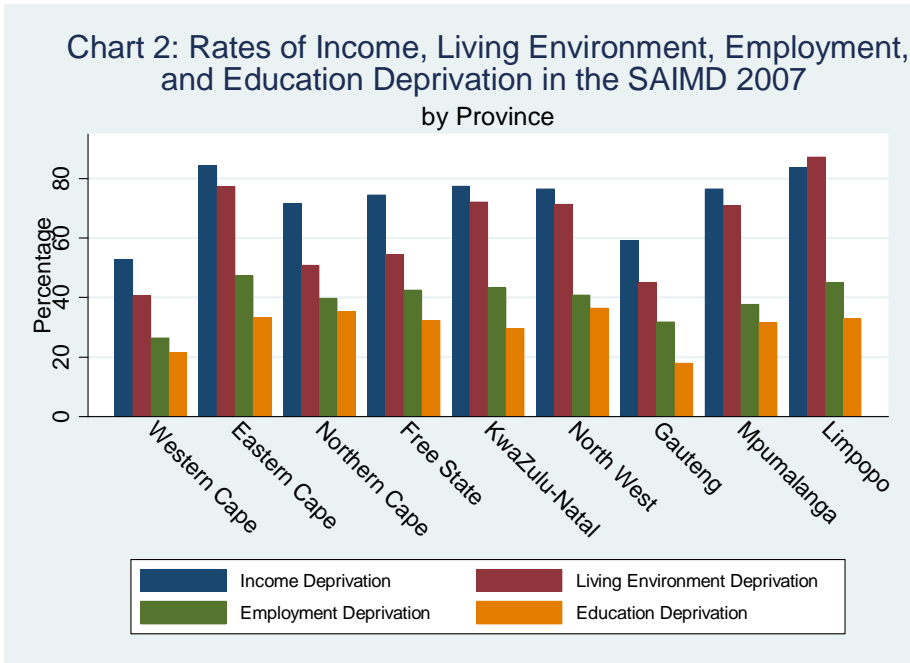
Chart 1: SAIMD by Province: Interquartile Range

In terms of the income/material deprivation domain, the Eastern Cape has the highest proportions of the population living in households that are income and/or materially deprived (84.2%) followed by Limpopo (83.6%) and KwaZulu-Natal (77.4%). The least deprived province for this domain is the Western Cape (52.8%).

For the employment deprivation domain, the highest rates of employment deprivation are in the Eastern Cape (47.2%) Limpopo (45%), KwaZulu-Natal (43.2%) and Free State (42.6%). The least deprived province for this domain is again the Western Cape (26.4%) followed by Gauteng (31.8%).

Limpopo has the highest percentage of people experiencing living environment deprivation (87.2%), followed by the Eastern Cape (77.2%), KwaZulu-Natal (72%), North West (71.4%) and Mpumalanga (70.9%). The Western Cape is the least deprived province (40.7%) followed by Gauteng (45%).

The province with the highest proportion of its adult population experiencing Education Deprivation is North West (36.5%) followed by the Northern Cape (35.3%) whereas Gauteng has the lowest proportion (17.9%).

Chart 2 displays this information graphically.

Chart 2: Rates of Income, Living Environment, Employment, and Education Deprivation in the SAIMD 2007
by Province

Charts 3 and 4 below show the interquartile ranges of the municipality ranks for each domain of the SAIMD 2007 in the Eastern Cape and Gauteng provinces, and the Eastern Cape and Limpopo respectively.

Chart 3: SAIMD 2007 by domain for the Eastern Cape and Gauteng
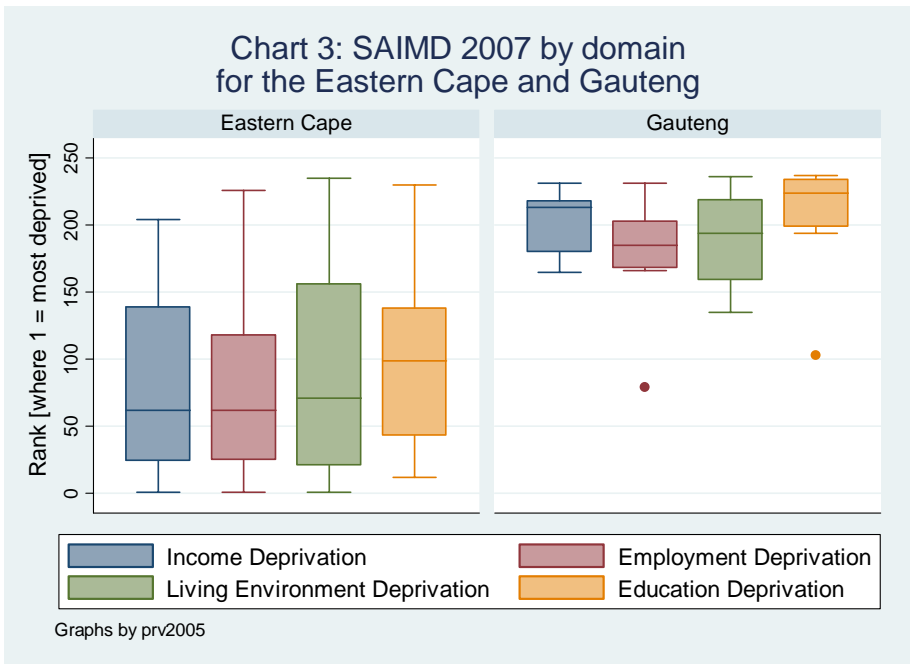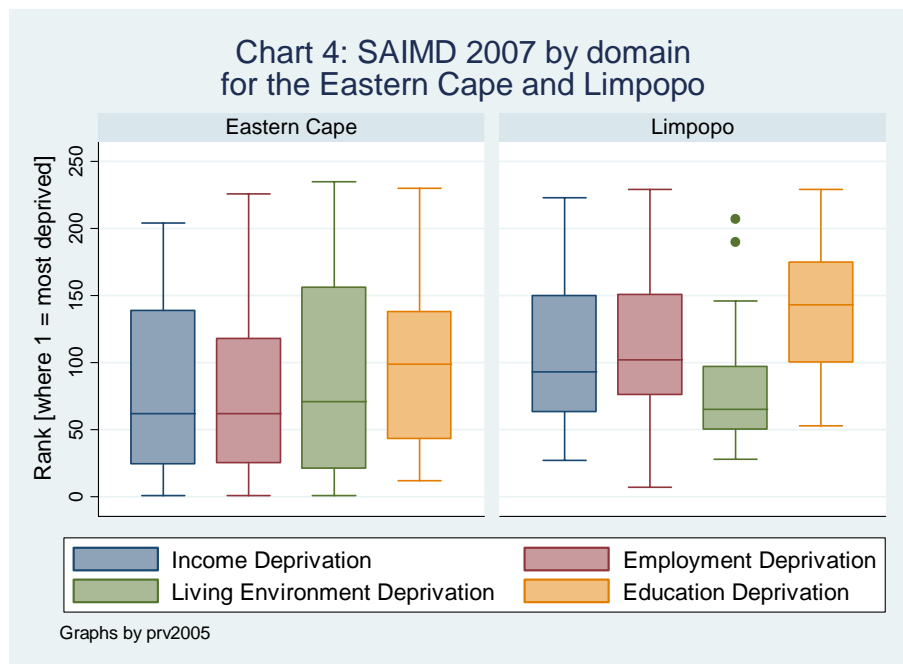

Graphs by prv2005

Chart 3 shows that municipalities in the Eastern Cape are much more deprived than those in Gauteng across all domains of deprivation. For three of the domains, the Eastern Cape has the most deprived municipality in the country (Income/Material Deprivation, Employment, and Living Environment Domains). Within the Eastern Cape, municipalities tend to be slightly less

deprived on the education domain than on other domains. In Gauteng, the interquartile range for each domain is tightly located towards the top of the chart, meaning that most municipalities in this province are amongst the least deprived in the country on each of the domains of deprivation. It should be noted, however, that the interquartile range for the Living Environment Domain is slightly wider than for the other domains, showing a wider range of Living Environment deprivation in the province (though all municipalities in Gauteng are in the least deprived half of municipalities in the country).

Chart 4 compares the SAIMD 2007 by domain for the Eastern Cape and Limpopo. The pattern of deprivation in Limpopo is that municipalities are slightly less deprived than in the Eastern Cape on each of the domains. However, in all cases the interquartile ranges in Limpopo are narrower, demonstrating less variation across the province than the Eastern Cape. This is explained by the fact that there are some relatively prosperous municipalities in the western part of the Eastern Cape such as Nelson Mandela Bay which will contribute towards a greater range of deprivation in that province. Within Limpopo, there are high levels of Living Environment Deprivation and a very small interquartile range.

Chart 4: SAIMD 2007 by domain for the Eastern Cape and Limpopo

Municipality level

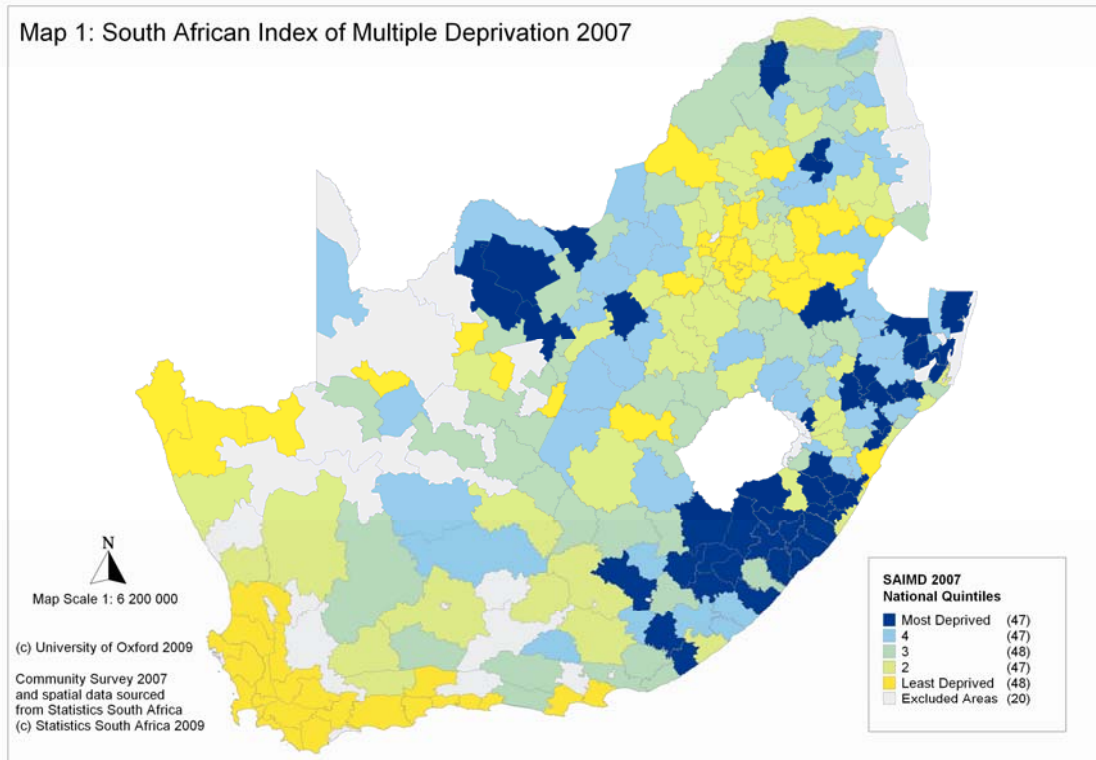There are five municipality level measures: four domain measures (which were combined to make the overall SAIMD 2007) and one overall SAIMD 2007. These five measures are each assigned a rank. As stated above, the most deprived municipality for each measure is given a rank of 1, and the least deprived is given a rank of 237. The ranks show how a municipality compares to all the other municipalities in South Africa.

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Table 1 lists the 20 most deprived municipalities in South Africa based on the SAIMD 2007. Intsika Yethu municipality is the most deprived in the country, located within the Eastern Cape, followed by Ratlou (in North West province). Ten of the 20 most deprived municipalities in South Africa are in KwaZulu-Natal, and six in the Eastern Cape.

Table 1: The twenty municipalities in South Africa with the highest levels of deprivation based on the SAIMD 2007

Rank (1=most deprived)	Municipality Code 2005	Municipality name
1	222	EC135: Intsika Yethu Local Municipality
2	606	NW381: Ratlou Local Municipality
3	522	KZN244: Msinga Local Municipality
4	210	EC121: Mbhashe Local Municipality
5	223	EC136: Emalahleni Local Municipality
6	224	EC137: Engcobo Local Municipality
7	325	NC451: Moshaweng Local Municipality
8	611	NW391: Kagisano Local Municipality
9	552	KZN435: Umzimkhulu Local Municipality
10	501	KZN211: Vulamehlo Local Municipality
11	231	EC152: Ntabankulu Local Municipality
12	520	KZN242: Nquthu Local Municipality
13	505	KZN215: Ezingoleni Local Municipality
14	542	KZN286: Nkandla Local Municipality
15	530	KZN265: Nongoma Local Municipality
16	546	KZN294: Maphumulo Local Municipality
17	518	KZN236: Imbabazane Local Municipality
18	539	KZN283: Ntambanana Local Municipality
19	233	EC154: Port St Johns Local Municipality
20	909	LIM351: Blouberg Local Municipality

The geography of deprivation across South Africa is now presented for the SAIMD 2007. The municipalities have been divided into *national* (i.e. South Africa wide) quintiles of deprivation - five equal groups. On the map, the thin grey lines depict the municipality boundaries. The most deprived 20% of municipalities *nationally* are shaded in a strong blue colour and the least deprived 20% of municipalities are shaded in bright yellow (areas left white are municipalities that were excluded due to small numbers as explained in Section 2).

Map 1: South African Index of Multiple Deprivation 2007

SAIMD 2007
National Quintiles

- Most Deprived (47)
- 4 (47)
- 3 (48)
- 2 (47)
- Least Deprived (48)
- Excluded Areas (20)

Map Scale 1: 6 200 000

(c) University of Oxford 2009

Community Survey 2007
and spatial data sourced
from Statistics South Africa
(c) Statistics South Africa 2009

The most deprived municipalities, based on the SAIMD 2007, are prominent in the Eastern Cape, KwaZulu-Natal and the North West province. On the other hand relatively little of the most severe deprivation is present in Gauteng or the Western Cape. It is striking that in 2007 the highest levels of deprivation still occur in the former homeland areas of South Africa.

The SAIMD 2007 draws from information about deprivation in each of the four domains. The Spearman's rank correlations between the domains and the SAIMD are shown in Table 2 below.
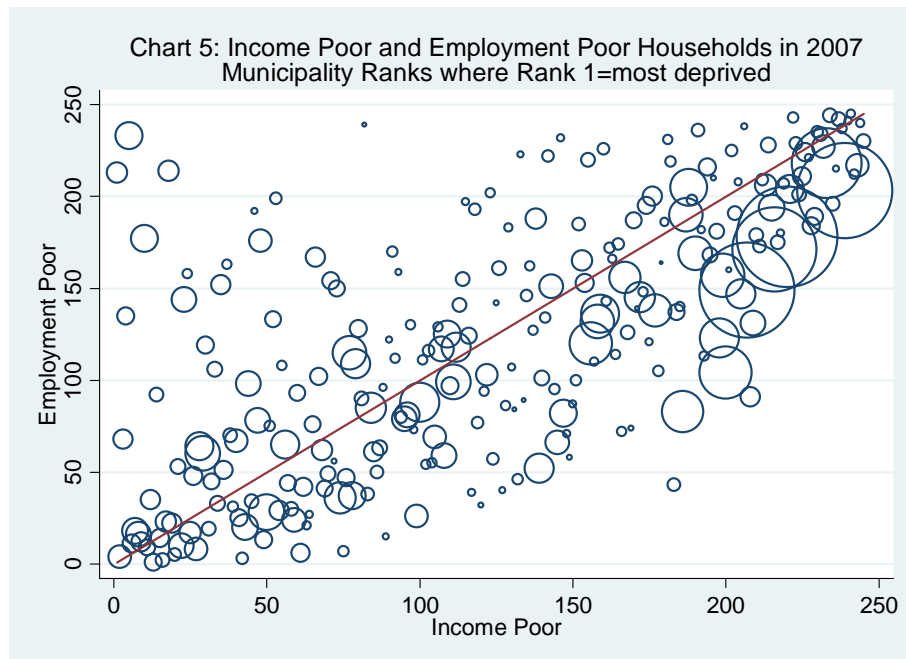
Table 2: Correlation between the municipality level SAIMD 2007 and the component domains

	SAIMD 2007	Income/ Material Deprivation	Employment Deprivation	Education Deprivation	Living Environment Deprivation
SAIMD 2007	1				
Income/ Material Deprivation	0.9603	1			
Employment Deprivation	0.7634	0.6886	1		
Education Deprivation	0.7715	0.6722	0.4195	1	
Living Environment Deprivation	0.8572	0.8719	0.5617	0.4801	1

Spearman's rank correlation, $p < 0.001$.

The highest inter-domain correlation is between the Income/Material Deprivation Domain and the Living Environment Deprivation Domain (0.87). The correlation between the Income/Material Deprivation Domain and the Employment Deprivation Domain is less high, at 0.69. Chart 5 below plots the

ranks for these two domains. Each circle represents a municipality and the size of the circle represents the population size of the municipality. Municipalities that are among the most deprived in the country on both domains are located in the bottom left hand corner of the chart. The municipalities in the top left hand corner of the chart are amongst the most highly deprived municipalities in terms of Income/Material Deprivation, but among the least deprived in terms of Employment Deprivation. It is therefore likely that people in these municipalities are 'earning their poverty' i.e. are in very low paid employment, though further work would need be done to validate this to ensure that it is not the result of an ecological fallacy.

Chart 5: Income Poor and Employment Poor Households in 2007
Municipality Ranks where Rank 1=most deprived

Metropolitan areas and the importance of taking population size into account

The combined presence of deprivation and the lack of it within the metropolitan areas means that they tend to be much less deprived *on average* than most non-metropolitan areas. For example, eThekwini has a rank of 202 on the SAIMD 2007, the City of Johannesburg has a rank of 219 and the City of Cape Town is ranked 236. This should not disguise the fact that there are very large numbers of deprived people (as well as non-deprived people) within the metros. Indeed, the five 'municipalities' with the largest *number* of people in income/materially deprived households are the metropolitan areas of the City of Johannesburg (2.24 million people in income/materially deprived households), eThekwini (2.16 million people), the City of Cape Town (1.78 million people), Ekurhuleni (1.6 million people) and the City of Tshwane (1.31 million people). These are far greater numbers of income/materially deprived people than in any of the non-metropolitan municipalities which, as well as being smaller in overall population size often have higher rates of deprivation due to the lack of affluent areas that exist in some parts of the major cities.

It is therefore very important that the numbers of deprived people are taken into account alongside the proportions, particularly when using geographical units with such varied population sizes.

4 How has deprivation changed between 2001 and 2007?

This final section explores the extent to which deprivation has changed between 2001 and 2007 at national and municipality levels.

In order to undertake this analysis it is necessary to produce a *matching set of variables* for 2001 and 2007 because the variables in the SAIMD 2007 presented above differ from those in the SAIMD 2001 (Noble *et al.,* 2009) in a number of ways which were highlighted in Section 2 above. These changes are caused by small changes in wording between the 2001 Census (which was used to develop the SAIMD 2001) and the Community Survey (which was used for the SAIMD 2007). The SAIMD 2007 also does not have a Health Domain.

It is also necessary to have a *matching set of geographical boundaries*: the SAIMD 2007 was produced on municipality boundaries relating to 2007, whereas the SAIMD 2001 was produced using datazones (Avenell *et al.,* 2009). In order to analyse change between the two time points at a national and municipality level it is necessary to use municipality boundaries, and preferable to keep the municipality boundaries constant. We therefore applied 2001 boundaries to both time points.

Therefore, for the purposes of the analysis in this section an SAIMD 2001 was created (on 2001 municipality boundaries) with variables that matched the SAIMD 2007. For the sake of clarity, we refer to the original datazone level SAIMD 2001 (Noble *et al.,* 2009) in this section as 'SAIMD 2001(original)' and the revised version (with variables that match the SAIMD 2007) as the 'SAIMD 2001(2007vars)'.

In addition, a new version of the SAIMD 2007 was created on 2001 boundaries, in order for there to be a common geography. Again, for the sake of clarity, the SAIMD 2007 that has been presented in the previous sections of this report is referred to in this section as the 'SAIMD 2007(original)' and the version used in this section for analysis of change over time is referred to as the 'SAIMD 2007(2001boundaries)'.

This section is therefore an analysis of change between the especially-created <u>SAIMD 2001(2007vars)</u> and the especially-created <u>SAIMD 2007(2001boundaries)</u>. These two indices have been constructed with a matching set of indicators and domains (i.e. those used in the SAIMD 2007(original)) on a common set of boundaries (i.e. the municipality boundaries of the 2001 Census).

The national picture

How has deprivation changed across the country as a whole between 2001 and 2007? Using the SAIMD 2001(2007vars) and the SAIMD 2007(2001boundaries) we find that there have been some improvements (see Table 3 below), though deprivation rates still remain very high.

The only indicator to 'change with the times' is the income deprivation indicator, which measures the percentage of people below 40% modified OECD income for each time point (2001 and 2007 respectively); all the other indicators are constant.

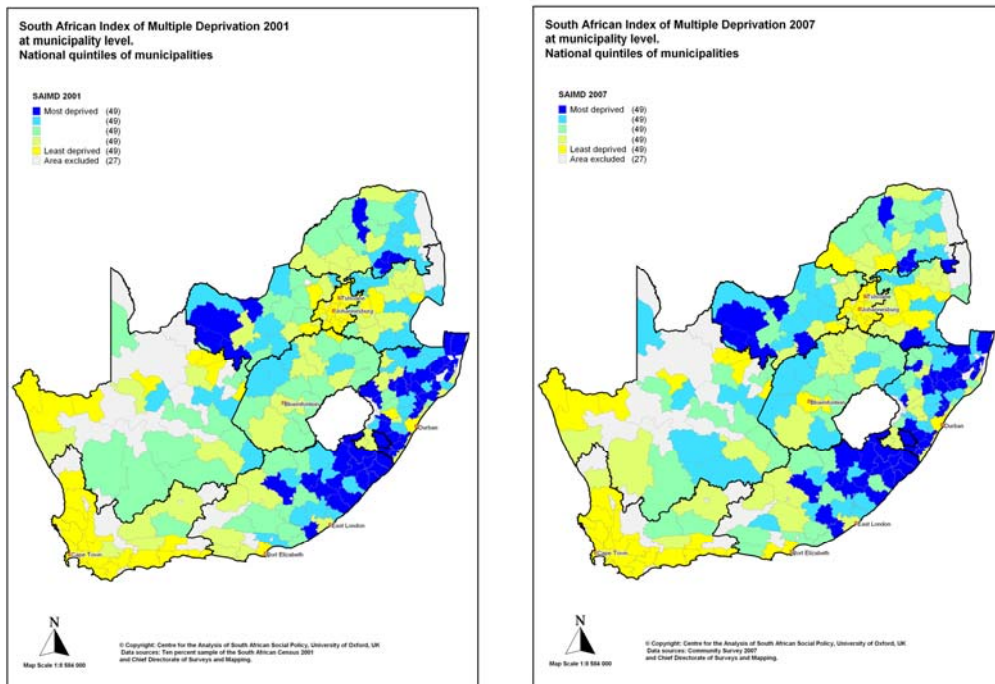**Table 3   National levels of deprivation in 2001 and 2007**

	2001 (%)	2007 (%)
Income/material deprivation	75.9	72
Employment deprivation	43.5	37.8
Living environment deprivation	67.2	63.6
Education deprivation	36.4	27.4

The percentage of people experiencing income/material deprivation has fallen by four percentage points. So too, the proportion experiencing living environment deprivation has fallen by almost four percentage points. Employment deprivation has fallen by almost six percentage points. The percentage of adults without any secondary schooling fell the most, by nine percentage points.
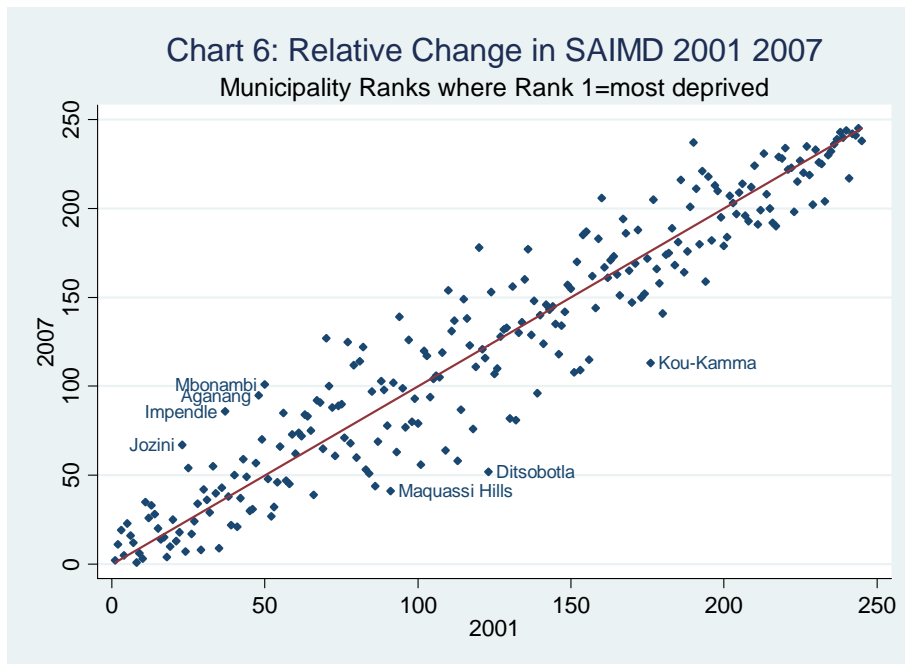
Municipality-level change

Map 2 compares the geographical profile of multiple deprivation in 2001 and 2007. The map on the left is the **SAIMD 2001(2007 vars)**, and the map on the right is the **SAIMD 2007(2001 boundaries)**, and so a common set of variables are being compared on a common set of boundaries for the two time points. The prominence of deprivation in the former homeland areas described in the previous section is evident for both time points, and it is striking the extent to which the highest rates of deprivation remain in the same areas even in the context of some absolute improvement (i.e. reduction in deprivation) in all of the domains.

Map 2: Relative Change in the Index of Multiple Deprivation between 2001 and 2007 at Municipality Level (2001 Municipality boundaries)
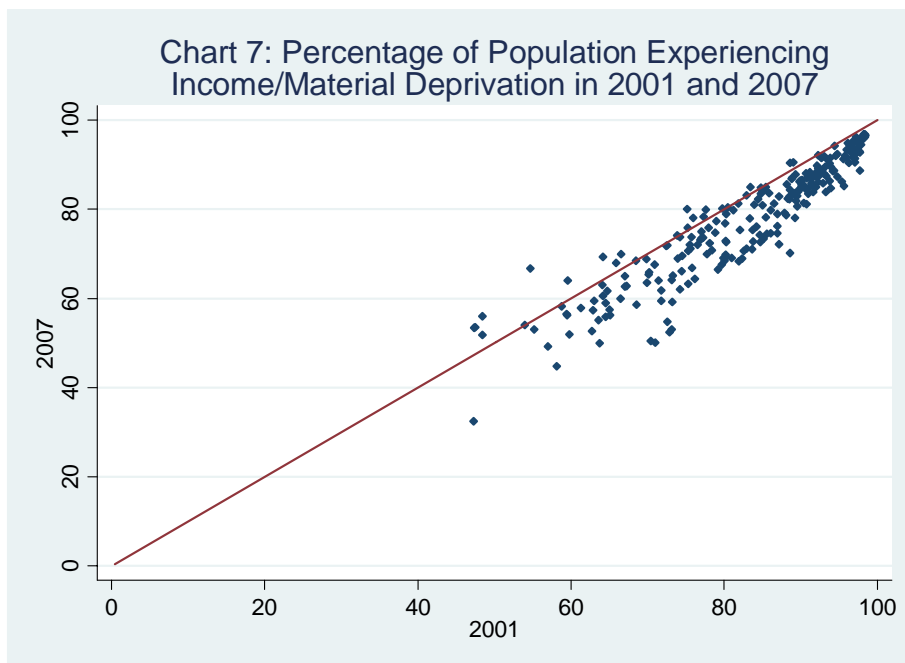

The change in relative position of municipalities between the SAIMD 2001(2007vars) and the SAIMD 2007(2001boundaries) can be seen in Chart 6. Municipalities which have become relatively more deprived between the two time points, in terms of their national rank position, include Maquassi Hills (North West), Ditsobotla (also in North West) and Kou-Kamma (Eastern Cape). Conversely, municipalities that have become relatively less deprived (again in terms of their national rank position) include Jozini (KwaZulu-Natal), Impendle (KwaZulu-Natal), Aganang (Limpopo) and Mbonambi (KwaZulu-Natal).

Chart 6: Relative Change in SAIMD 2001 2007
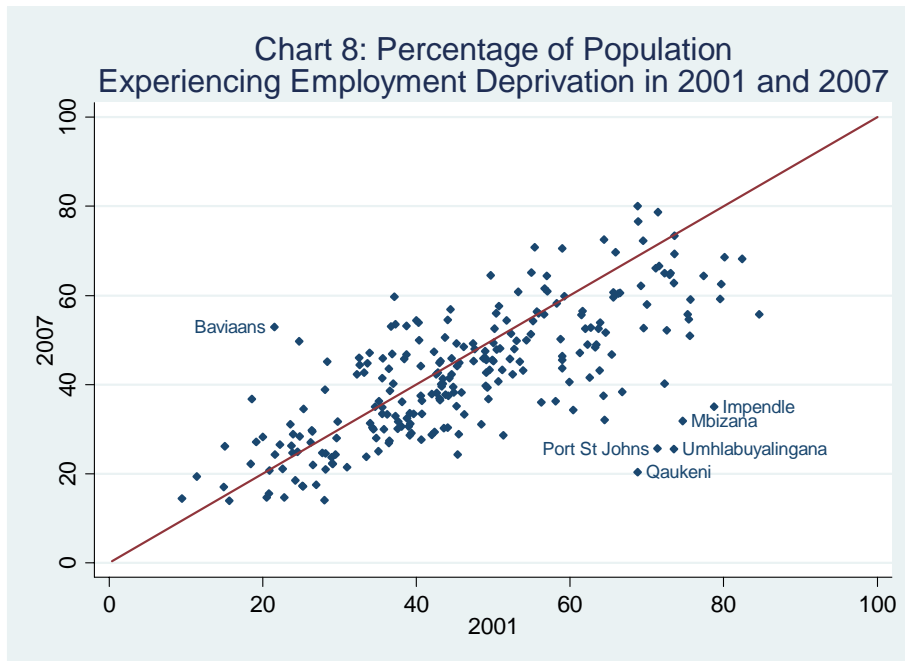Municipality Ranks where Rank 1=most deprived

NB. Using SAIMD 2001(2007vars) and SAIMD 2007(2001boundaries), i.e. a common set of variables and common boundaries.

It is possible to examine the extent of absolute change between 2001 and 2007 for each municipality for each of the four domains. Chart 7 shows the percentage of people living in Income/Material Deprivation in 2001 and 2007: almost all municipalities have improved between the two time points, with lower rates in 2007 than in 2001.

Chart 7: Percentage of Population Experiencing Income/Material Deprivation in 2001 and 2007

However, this is not the same pattern for the Employment Domain. As Chart 8 shows, a large number of municipalities have deteriorated between 2001 and

2007 (municipalities above the red line) and Baviaans (EC) is an extreme example. Nevertheless, many municipalities have improved over this time period (municipalities below the red line), including Port St Johns (EC), Impendle (KZN), Qaukeni (EC) and Umhlabuyalingana (KZN) and Mbizana (EC).

Chart 8: Percentage of Population Experiencing Employment Deprivation in 2001 and 2007

The national fall in the percentage of adults without any secondary schooling is also evident at municipality level (see chart 9). Almost every single municipality has improved. The adult population in South Africa has therefore become increasingly educated, based on this definition.

Chart 9: Percentage of Population
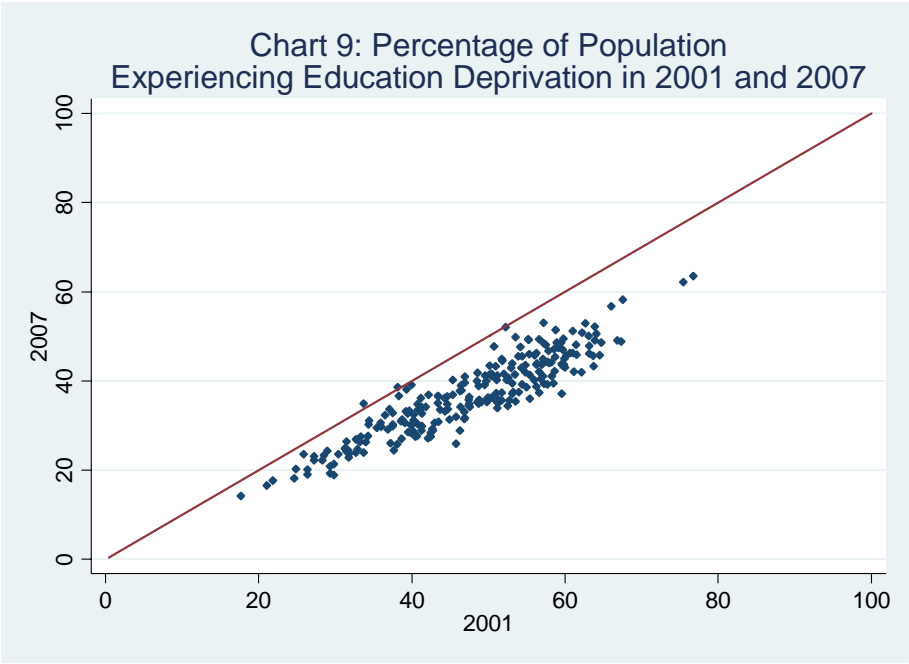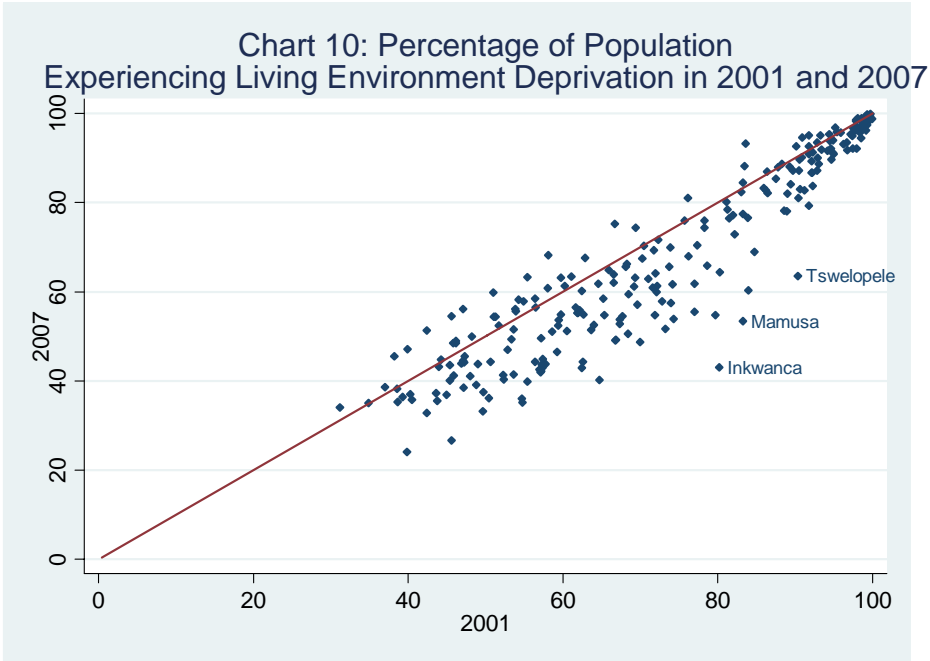Experiencing Education Deprivation in 2001 and 2007

Chart 10 shows the percentage of people experiencing Living Environment Deprivation in 2001 and 2007 at municipality level. Whilst a number of municipalities have deteriorated (those above the red line), most have improved between these two time points, most notably Tswelopele (Free State), Mamusa (North West) and Inkwanca (Eastern Cape).

Chart 10: Percentage of Population
Experiencing Living Environment Deprivation in 2001 and 2007

5 Concluding Remarks

The SAIMD 2007 at municipality level provides information about the geographical distribution of poverty and deprivation across South Africa. The geographical profile of poverty and deprivation has not changed much between 2001 and 2007, with the highest rates of poverty and deprivation occurring mainly in the former homeland areas in 2007, as in 2001.

However, there have been improvements at a national level in terms of the percentage of people experiencing each type of deprivation (i.e. absolute change in the levels of deprivation): for all four domains of deprivation the percentage of people experiencing each type of deprivation has fallen. The greatest improvement is the Education Deprivation domain, with a drop of 9 percentage points.

At a municipality level, whilst almost all municipalities have improved on the Income/Material Deprivation Domain and the Education Deprivation Domain, there are a number of municipalities that have deteriorated on the Employment Deprivation Domain and the Living Environment Deprivation Domain. This demonstrates the importance of considering deprivation in a multi-dimensional way; whilst some types of deprivation may be improving, others may be deteriorating. It also demonstrates the importance of examining deprivation at a sub-national level, as it is not the case that levels of deprivation have fallen in all parts of the country: some areas have become less deprived more quickly than others, whilst others have deteriorated.

It will be important to continue to monitor change in poverty and deprivation in South Africa over time, particularly after the release of the forthcoming Living Conditions Survey 2008/09 and the 2011 Census of population.

In the meantime, a research project is underway to explore different statistical techniques for estimating deprivation scores in 2007 at a sub-municipality level, in order to develop a sub-municipality level SAIMD 2007.

Appendix 1 Indicators used in the SAIMD 2007

This Appendix gives further details of the indicators that were used in the SAIMD 2007. All indicators were derived from the 2007 Community Survey (CS) (Statistics South Africa, 2007 and 2008). Information on the CS question used and the responses (codes) selected to define a person as deprived are provided below. All numerators and denominators exclude people living in institutions. For all domains the score was calculated as a simple rate: i.e. the percentage of people experiencing deprivation on one or more of the indicators in that domain. Unless otherwise indicated, the indicators (numerators and denominators) listed below take into account people of all ages, derived from CS question p03_age ("What is (the person's) age in completed years?").

The Statistics Council produced a 'cautionary note' about the Community Survey. We have considered these concerns and where possible taken steps to reduce them (see especially the section in this Appendix about the Income/Material Deprivation Domain). The note specifically cautions against using municipality level age breakdowns of variables (which is undertaken here in the Education Domain and the Employment Domain). However, we have undertaken empirical Bayesian shrinkage estimation in order to test the robustness of the domains at municipality level and obtained a 'pre-shrunk' and 'post-shrunk' Spearman rank correlation coefficient of 1 (p=0.0000).

A1 Income and Material Deprivation Domain

Numerator

Number of people living in a household that has a household income (need-adjusted using the modified OECD equivalence scale) that is below 40% of the mean equivalent household income
The CS 2007 question P52_Income_Category ("What is the income category that best describes the gross monthly or annual income of (the person) before deductions and including <u>all sources</u> of income?") was used to calculate a household income. A household equivalent income was calculated using this variable, the 'modified OECD' equivalence scale, and CS 2007 question p03_age ("What is (the person's) age in completed years?"). The cut-off used was 'below 40% mean household equivalent income'.

Missing and implausible income data in the CS 2007 was imputed using sequential regression multiple imputation techniques (see Barnes (2009) for details about how the technique was applied to the CS 2007 income data).

Number of people living in a household without a refrigerator
This indicator used CS question H10A_Fridge ("Does the household have any of the following: radio, television, computer, *refrigerator*, telephone in the dwelling, cell-phone?"). People were selected who lived in a household without a refrigerator (code 2).

Number of people living in a household with neither a television nor a radio
This indicator used CS question H10C_Television and H10B_Radio ("Does the household have any of the following: *radio*, *television*, computer, refrigerator, telephone in the dwelling, cell-phone?"). People were selected who lived in a household with neither a radio nor a television (code 2 for both radio and television).

Ten versions of the income domain's numerator were averaged (using income data from each of the ten imputations) before producing the income score.

Denominator

This domain used the total population as the denominator.

A2 Employment Deprivation Domain

Numerator

Number of people who are unemployed (using official definition)
People were selected if they were aged 15-65 and DER01_Veso was equal to 2 (a derived variable about employment status, where 2=unemployed, based on the official unemployment definition).

Number of people who are not working because of illness or disability
People were selected if P32_Why_Not was equal to 5 (where 5=invalid, ill, disabled or unable to work).

Denominator

This domain used the total economically active population (aged 15-65) and those not able to work due to sickness/disability as the denominator.

A simple proportion was calculated of adults who were either unemployed or too sick/disabled to work divided by the total economically active population plus those not able to work due to sickness/disability.

A3 Education Deprivation Domain

Numerator

Number of adults aged 18-65 with no secondary schooling
This indicator used CS questions p03_age ("What is (the person's) age in completed years?") and p29_Level_Educ ("What is the highest level of education that (the person) has completed?). Adults aged 18-65 with no schooling (p29_Level_Educ, code 24) or who had not completed Grade 8 (p29_Level_Educ, code 00-07) were selected.

Denominator

This indicator used adults aged 18-65 as the denominator.

A simple domain score was calculated of the percentage of 18-65 year olds with no secondary schooling.

A4 Living Environment Deprivation Domain

Numerator

Number of people living in a household that has no piped water inside the dwelling or yard
This indicator used CS question h03_water_access ("In which way does this household obtain water for domestic use?") and selected people in households that didn't respond 'piped water inside the dwelling' (code 1) or 'piped water inside the yard' (code 2).

Number of people living in a household that has no use of electricity for lighting
This indicator used CS question h09_lighting ("What type of energy/fuel does this household mainly use for lighting?") and selected people in households that did not respond 'electricity' (code 1).

Number of people living in a shack
This indicator used CS h01_hu ("Which of the following types best describes the main dwelling unit that this household occupies?") and selected people in households that responded 'informal dwelling/shack in back yard' (code 6), or 'informal dwelling/shack not in back yard e.g. in informal/squatter settlement' (code 7).

Number of people living in a household that has neither a pit latrine with ventilation nor a flush toilet
This indicator used CS h06_toilet_facil "What is the main type of toilet facility available for use by this household?" and selected people in households that didn't respond 'flush toilet (connected to sewerage system)' (code 1), 'flush toilet (with septic tank)' (code 2), or 'pit toilet with ventilation (VIP)' (code 4).

Number of people living in a household that is crowded
This indicator was calculated using CS question h_02rooms "How many rooms, including kitchens, are there for this household? Count all rooms in all dwellings. Exclude bathrooms, sheds, garages, stables, etc. unless persons are living in them."

Overcrowding was defined as taking place if the number of people in the household (of any age) divided by the number of rooms was greater than or equal to two.

Denominator

This domain used the total population as the denominator.

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