HUMAN AND SOCIAL DYNAMICS (HSD) RESEARCH SEMINAR SERIES

SPATIAL MEASURES OF SOCIO-ECONOMIC INEQUALITY IN SOUTH AFRICA

3 March 2015
Research Seminar Report

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Department of Science and Technology (DST)
Human and Social Dynamics (HSD) Research Seminar
Spatial measures of socio-economic inequality in South Africa

The Human Sciences Research Council (HSRC)
Southern African Social Policy Research Institute (SASPRI)
Institute of Social and Economic Research (ISER) Rhodes University

3 March 2015
HSRC Cape Town,
with video links to HSRC Pretoria and HSRC Durban

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ACRONYMS AND ABBREVIATIONS

A	Answer
C	Comment
CSIR	Council for Scientific and Industrial Research
DFID	Department for International Development (UK)
DST	Department of Science and Technology
DSD	Department of Social Development
ESRC	Economic and Social Research Council (UK)
HSRC	Human Sciences Research Council
IDRC	International Development Research Centre (Canada)
ISER	Institute of Social and Economic Research
KZN	KwaZulu-Natal Province
LLTI	Limiting Long Term Illness
LR	Likelihood ratio
NSI	National System of Innovation
Q&A	Questions and Answers
Q	Question
SALDRU	Southern Africa Labour and Development Research Unit
SAIMD	South African Index of Multiple Deprivation
SAIMDC	South African Index of Multiple Deprivation for Children
SASAS	South African Social Attitudes Survey
SASPRI	Southern African Social Policy Research Institute
UN	United Nations
UCT	University of Cape Town

PREFACE: THE PURPOSE OF DST RESEARCH SEMINARS

The Department of Science and Technology (DST) Human and Social Dynamics Research Seminar Series is designed to: (i) showcase research and knowledge production in the Social Sciences and Humanities (SSH) which is generated by the National System of Innovation (NSI); (ii) serve as a vehicle for disseminating research evidence to wider and diverse audiences; (iii) operate as a platform for the sharing of local and international expertise and experience; and (iv) promote research and knowledge production in the Humanities that benefits and enhances the NSI.

The HSD Research Seminar Series aims to:

- Disseminate scientific research findings and transmit a body of new knowledge (through an interactive process of critical dialogue and collegial critique) to the SSH research community and other interested actors in the NSI;
- Provide an avenue for rated and other researchers, including researchers from rural-based universities, to engage in knowledge dialogues across faculties and with other interested actors in the NSI;
- Present and discuss new and ongoing research, identify research gaps, and suggest new research agendas in SSH with a view to forging closer links between the research communities in these fields;
- Reinforce the visibility of SSH research to the higher education and science council sector;
- Enhance wider public understanding of the SSH, including the value and status of both individual and team-based research; and
- Strategically promote, develop, and coordinate collaborative and interdisciplinary research within and between Higher Education Institutions and Science Councils.

EXECUTIVE SUMMARY

This Research Seminar, which was held on 3 March 2015 in Cape Town, with video links to Pretoria and Durban, formed part of a series facilitated by the Department of Science and Technology aimed at wider dissemination and application of research in the social sciences and humanities. The seminars bring together local and international researchers to discuss the latest research, identify research gaps, suggest new research agendas and explore potential policy relevance. The seminar was attended by representatives of national and provincial government departments, researchers from South African universities and research organisations, and experts on spatial measures of socio-economic inequality from South Africa and the United Kingdom.

The purpose of the seminar was to share knowledge about new measures of spatial inequality and their application for better understanding of outcomes including attitudes towards inequality and possible links to social unrest and violent crime.

The seminar began with a presentation by *Prof Michael Noble* and *Dr Wanga Zembe*, of the Southern African Social Policy Research Institute (SASPRI), who provided an overview of poverty and multiple deprivation in South Africa. They showed a persistent pattern of poverty which is concentrated in the former homelands and some rural areas. At the same time, there is less inequality in these areas, as measured by Gini coefficient, and the greatest inequality is to be found in metropolitan areas. This study highlighted a need for more sophisticated measures to reflect the 'lived experience' of inequality.

Dr Chris Lloyd, University of Liverpool, provided an international perspective on spatial inequality using information from the UK, USA and South Africa. He demonstrated how different variables can show quite different spatial variation with some showing distinct regional variation and others local clustering. Knowing these scales of geographical inequality and local clustering has relevance for policy. In the UK, clustering of social rented housing over small areas increased between 2001 and 2011. For a health indicator (Limiting Long Term Illness), there was clustering over small areas but no evidence of spatial structure; the variance increased between 2001 and 2011 indicating that regions are becoming more dissimilar. In simple terms, there has been increased clustering within regions of the UK but decreased difference between regions for many population variables.

There was a broadly similar geography for the USA and England and Wales for common demographic and socio-economic variables. When comparing the index of multiple deprivation (IMD) for South Africa with England and Wales, *Lloyd* found some regional differences in the UK IMD between North and South but the regional differences were much more marked in South Africa when comparing, for example, the Eastern Cape with the Western Cape.

David McLennon, University of Oxford, explained new methods for analysing inequality which seek to capture people's 'lived experience' of inequality. In urban areas, rich and poor often live side by side and the inequality is very obvious to all, but in rural areas, although poverty may be high, there is no immediate exposure to affluence. There may be a contrast in people's attitudes and actions as a result of this. There is marked spatial inequality in Johannesburg where the Northern suburbs are wealthy and the Southern suburbs tend to be poorer. In contrast, an area such as King Sabata Dalindyebo municipality (Mthatha), in the former Transkei, is almost uniformly poor with just a few pockets of wealth in the urban area. Further work explored exposure to inequality by determining the likelihood of residents visiting other neighbourhoods.

The studies found that exposure to socio-economic inequality is typically highest in the urban areas, particularly the metropolitan municipalities. There are strong correlations at datazone level between specific measures of exposure (income, employment, education, living environment). A composite measure showed that exposure is typically highest in Tshwane and Cape Town, but that there is far more variation within Tshwane than within Cape Town. It was hypothesised that places exposed to

very high poverty and very high exposure to inequality may be predisposed to social unrest and violent crime; this is to be the subject of further analysis.

Ben Roberts, Human Sciences Research Council, looked at how exposure to inequality relates to public perceptions and preferences for change, particularly in terms of state-led initiatives. He used data from the South African Social Attitudes Survey (SASAS 2003-2011) which showed a consensus that income differences in South Africa are too large and that the majority of people was in agreement that the state is responsible for correcting this. The study presented was experimental in conception and focused in scope but showed that exposure to inequality exerts some effect on people's attitudes to inequality and options for redress, but the effects are primarily observable through the interaction of exposure with other explanatory variables. Further research is required to produce more concrete evidence of the interplay between spatial inequality and citizen attitudes.

The seminar concluded with a panel discussion of the usefulness of the proposed inequality measures and how the inequality exposure variable can be linked to crime or other outcomes. There was support for collaboration between the various research bodies represented and a strong sense that this research has potential for providing evidence which will be relevant for guiding government policy on poverty and inequality.

INTRODUCTION

PURPOSE

Drawing upon recent and ongoing research in South Africa, this workshop sought to share knowledge about the development of new measures of spatial inequality and their application as explanatory variables in order to better understand outcomes at both the individual level (e.g. people's attitudes towards inequality and options for redress) and the area level (e.g. hotspots of social unrest and violent crime).

BACKGROUND

Almost two decades after the end of apartheid, South Africa continues to be characterised by very high levels of poverty, deprivation and inequality (Leibbrandt, Woolard, Finn, & Argent, 2010). It has been shown that poverty and deprivation are spatially differentiated, with the highest levels of both occurring in the former homelands and, to a lesser but still significant extent, in urban informal settlements (Noble & Wright, 2013). In terms of income inequality, South Africa's Gini coefficient of 0.7 is one of the highest in the world (Alexander, 2010; Leibbrandt et al., 2010; UNDP, 2013) and, in contrast to some countries in South America where the Gini coefficient has been falling in recent years (Gasparini, Cruces, Tornarolli, & Marchionni, 2008; Gasparini & Lustig, 2011; Lustig, Lopez-Calva, & Ortiz-Juarez, 2012), South Africa's has remained persistently high (Leibbrandt et al., 2010).

Internationally, persistent inequality, rather than poverty per se, is increasingly regarded as a major correlate of various social ills (Kaufmann D, Kraay A, & M., 2010; Wilkinson R & Pickett K, 2010). In South Africa this is particularly the case in respect of social unrest and violent crime. For example, the escalating service delivery protests (particularly in urban informal settlements) have been attributed to, among other things, stark socio-economic inequalities between different sections of the population and between different geographical areas (Alexander, 2010). However, this assertion has so far only limited empirical validation (Noble & Wright, 2013). Similarly, although there is a growing body of international evidence that supports the contention that inequality is an important factor in crime causation (e.g. Bourguignon, 1999; Leigh, Jencks, & Smeeding, 2009; Lynch et al., 2001; Sampson, 2006; Sampson & Wilson, 1995; UNODC, 2011; Wikstrom, 2006a; Wikstrom & Treiber, 2009), there is very little empirical evidence from within South Africa, the main exception being a study based upon data for the year 1996 (Demombynes & Ozler, 2006).

The lack of empirical evidence linking socio-economic inequality to social unrest and violent crime in South Africa should not be read as a rejection of such relationships, but rather as an outcome of the lack of adequate data on what one might term the 'lived experience of inequality'.

The mechanisms through which a person's lived experienced of socio-economic inequality may serve to encourage particular forms of action, whether this be involvement in violent crime, participation in (peaceful or non-peaceful) public protests, or other forms of demonstration, are indeed complex. It could be argued that people's experience of inequality plays an important role in shaping their beliefs as to the sort of society in which they may wish to live, and the means through which they aim to achieve that goal. Given that people's experience of inequality is likely to influence their attitudes towards inequality and subsequently their propensity to engage in (legal or illegal) 'action responses' to inequality (Wikstrom, 2004, 2006b), there is a pressing need for research that investigates the extent to which individuals experience socio-economic inequality as they go about their daily lives. People may be exposed to inequality in a variety of ways and settings. Inequality may be apparent between different broad sectors of the population, such as between gender groups, racial groups or age groups. It may be apparent at a very local level, such as between different members of the same household, immediate family, extended family or friendship network, and may be apparent between neighbours living in the same street or village, or between different geographic communities. In a globalising world characterised by mass media, inequality may be apparent between different provinces, countries or even continents.

An individual's first-hand experience of inequality may be shaped both by the degree to which they come into personal contact with those from the opposite ends of the socio-economic spectrum, and also by the stark visual signs of inequality that do not involve direct personal contact. For example, a wealthy person driving along a highway may observe the highly deprived informal settlements without actually coming into personal contact with the residents of those settlements. Similarly, a poor person may travel through or spend time in affluent neighbourhoods whilst seeking work and thus observe the stark visual signs of affluence, but with little or no personal interaction with the affluent residents of those neighbourhoods. People's first-hand experience of inequality is therefore contoured by the geographical settings in which they live, work, socialise and travel.

Given that people generally carry out their routine daily activities within fairly limited geographical spaces (Johnston & Pattie, 2011), a measure of the lived experience of inequality must reflect the context of *place*. By overlaying the spatial patterning of people's routine daily activities upon the spatial configuration of poverty and affluence in the areas that they inhabit or may visit, a measure of spatial inequality has been developed that is described as a geographical measure of the 'lived experience of inequality'. This new measure is currently being used as a neighbourhood level explanatory variable for investigations into people's attitudes and into the drivers for various social problems.

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THE SEMINAR

Most of the slides used in the presentations summarised below are provided in Appendix 4 but they may also be accessed via the *Policy > Action Network* web site http://www.pan.org.za/node/9852. The reader is advised that many of the slides contain fine detail and multiple overlays which are better viewed on-line rather than in printed form.

SESSION 1

SETTING THE SCENE – THE SPATIAL PATTERNING OF POVERTY AND MULTIPLE DEPRIVATION IN SOUTH AFRICA

Prof. Michael Noble, Executive Director of Southern African Social Policy Research Institute (SASPRI), Honorary Research Fellow Human Sciences Research Council (HSRC), Visiting Professor Rhodes University

Dr Wanga Zembe, Director and Research Fellow, SASPRI

Wanga Zembe began by providing some context for other presentations and outlining the spatial pattern of poverty and multiple deprivation in South Africa. South African Indices of Multiple Deprivation from 2001 to 2011 have consistently shown the persistence of spatial differentiation in terms of social and economic segregation which has origins in the legacies of colonialism, segregation and apartheid.

Persistent inequality, rather than poverty per se, is increasingly regarded as a major correlate of various social problems but inequality is usually expressed at high levels of spatial aggregation and says little about an individuals' 'lived experience' of inequality. Income poverty at ward level has been described using the Hoogenveen & Özler (2006) poverty line updated to 2011 giving an upper bound of R1113 per capita per month and a lower bound of R604 pcpm.

The Eastern Cape, KwaZulu-Natal (KZN) and Limpopo have the highest ward-level lower bound income poverty. Of the 10 poorest District Municipalities, five are in KZN, four in the Eastern Cape and one in Limpopo. Of the 20 poorest Local Municipalities, 19 are in the Eastern Cape or KZN with one in Limpopo.

Mapping ward level poverty for each province highlights pockets of poverty in many of the former homeland areas. For example, in Figure 1, showing the Free State province, areas of poverty, highlighted in blue, are concentrated in former homeland areas including QwaQwa, with its capital Phuthadijhaba in the East, and Thaba 'Nchu near Bloemfontein, which formed one of the many fragments of Bophuthatswana.

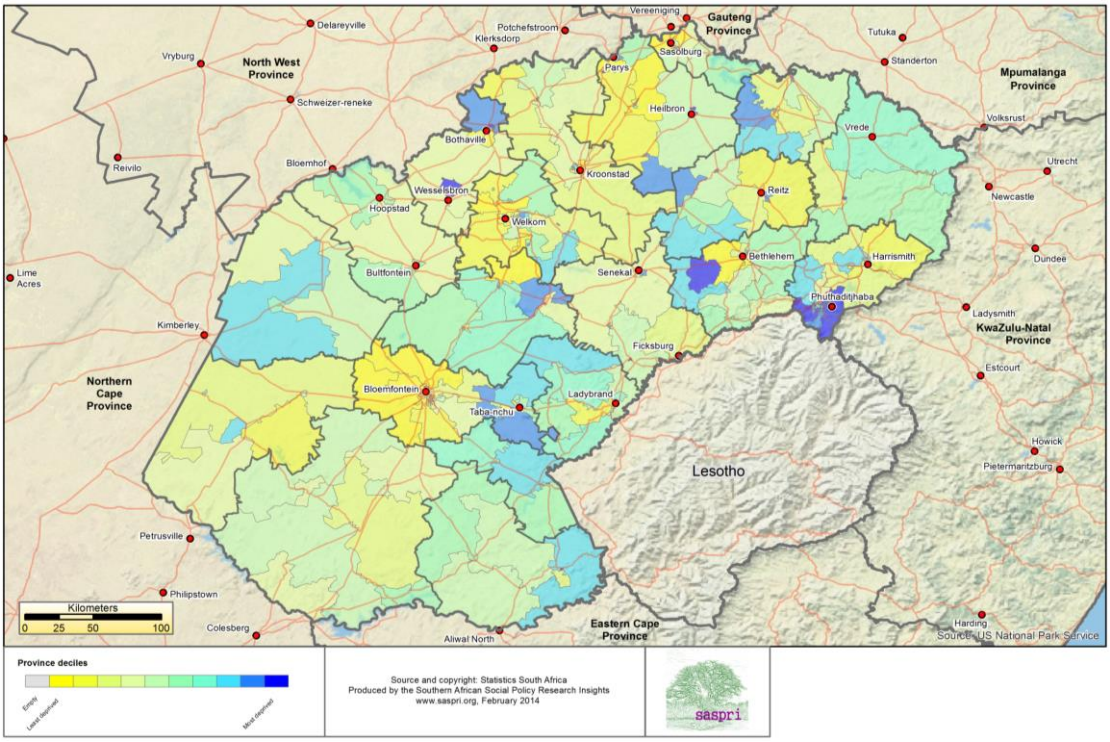


Figure 1 Ward level income poverty rates 2011 (poverty line R604 per capita per month) Free State Province. Most deprived = blue, Least deprived = yellow.

Figure 2 shows that although most of Gauteng is colour coded yellow, for less deprived, the poorer areas (in blue/green) coincide with townships which are often furthest from the economic opportunities of Johannesburg.

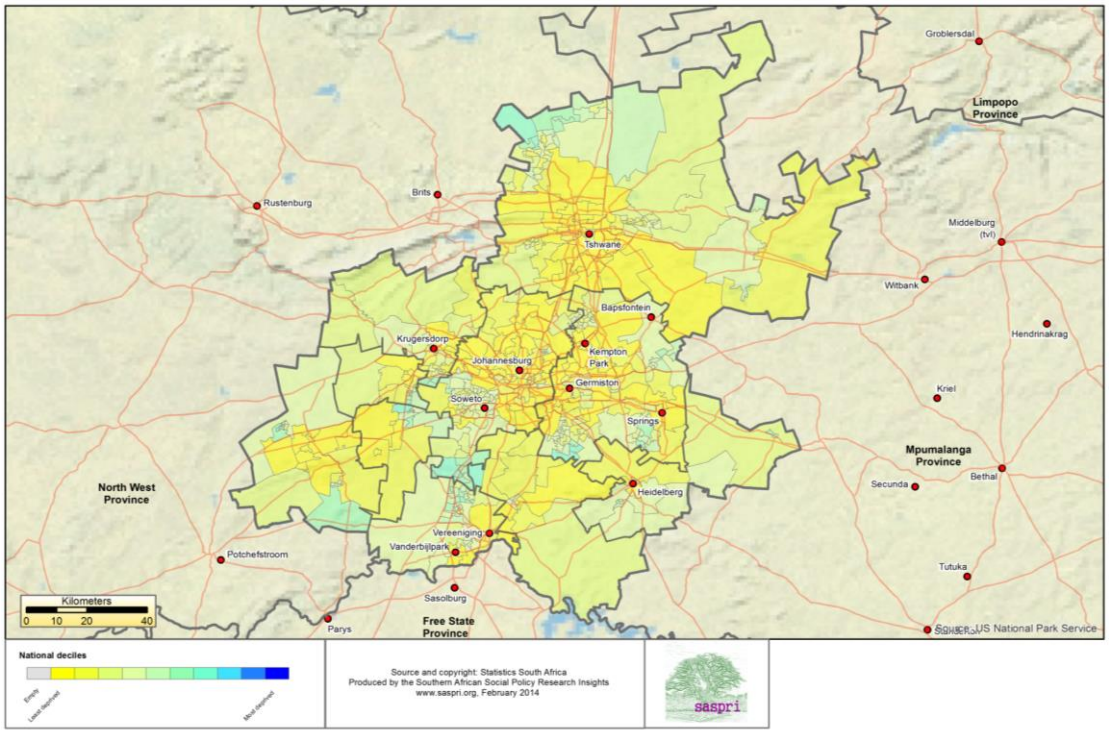


Figure 2 Ward level income poverty rates 2011 (poverty line R604 pcpm) Gauteng Province

For the Western Cape there are no former homelands but the pattern of poverty includes townships and remote rural areas such as Beaufort West, Graaff Reinet and Outshoorn (Figure 3).

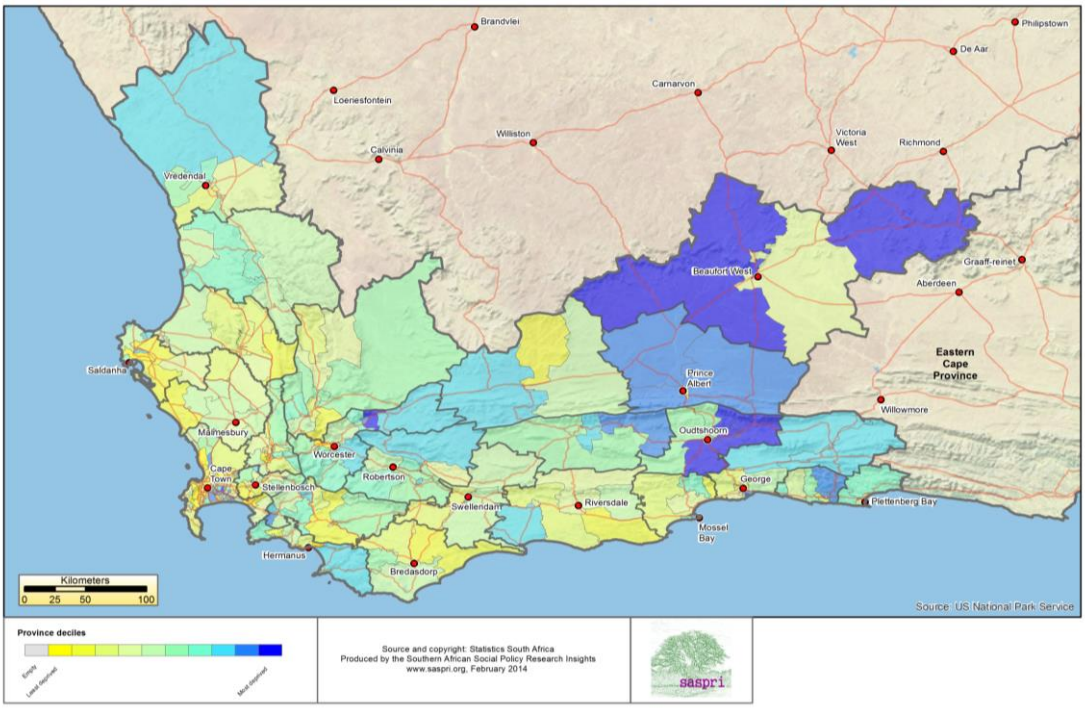


Figure 3 Ward level income poverty rates 2011 (poverty line R604 pcpm) Western Cape Province

Michael Noble explored spatial variation in equality in terms of Gini coefficients and Lorentz curves. There are more sophisticated tools but this approach was considered a useful starting point.

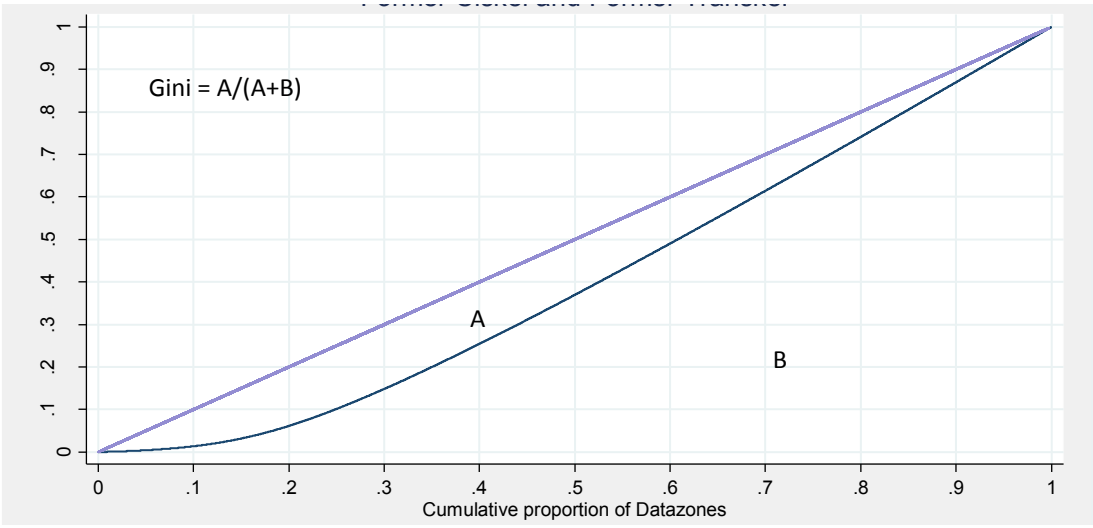


Figure 4 Lorentz curves for Income Deprivation at Datazone Level (SAIMDC). South Africa (dark blue) and the line of perfect equality (light blue)

Figure 4 compares the line of perfect equality (light blue) with the Lorentz curve (black) for South Africa. Figure 5 shows the measure of inequality for various parts of the country. The line for the Eastern Cape (brown) is closer to equality than the overall South African one, which is almost obscured by Buffalo City (gold). Nelson Mandela Bay Metro (green) has more inequality than South Africa whereas the former Ciskei (grey) is more equal than the Eastern Cape and the former Transkei (red) is even more equal. In reality, the areas where inequality is low are characterised by people who are all equally poor.

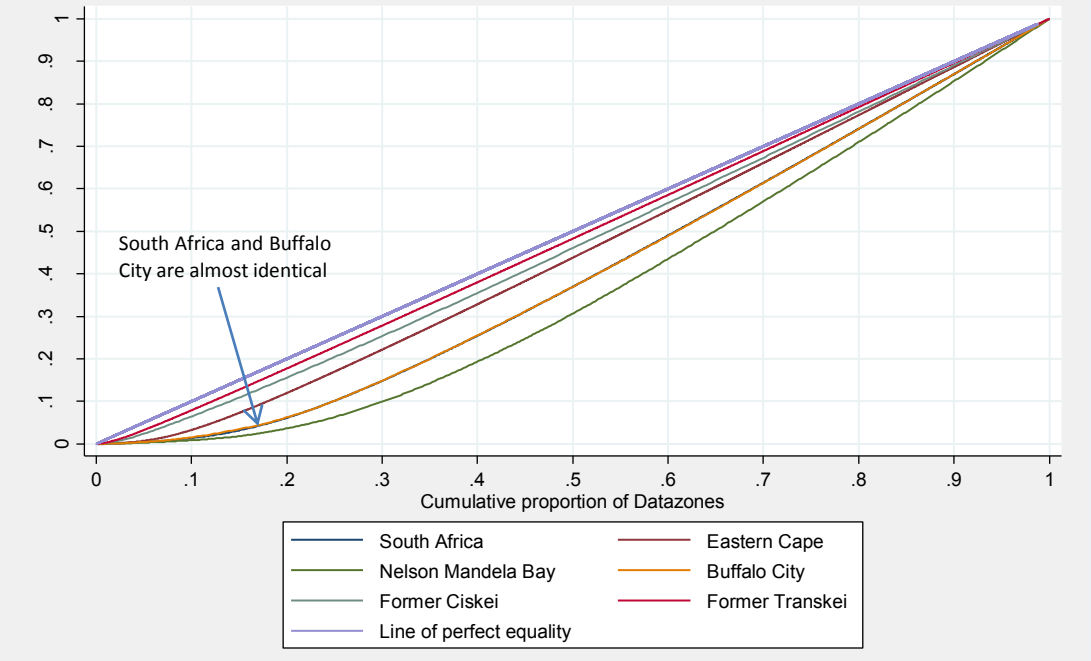
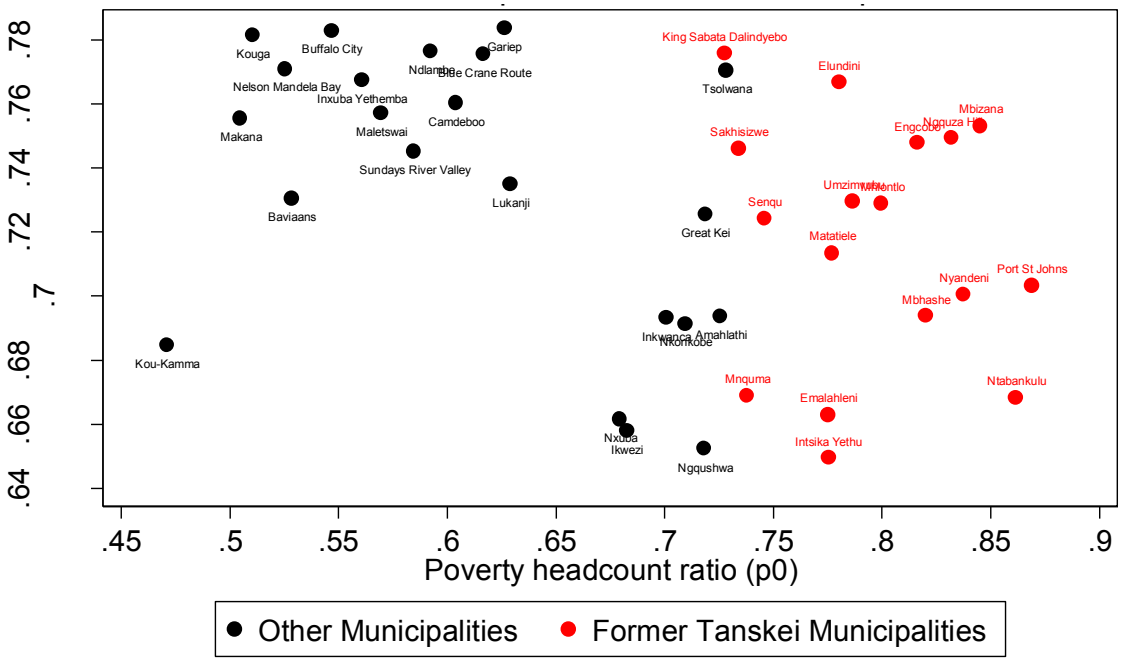


Figure 5 Income Deprivation at Datazone Level

Further information can be derived by comparing income poverty and inequality at local municipality and metropolitan level. Scatter plots of the Gini coefficient against the poverty head count ratio (lower bound) clearly show two clusters. Many of the municipalities in the former Transkei (shown in red in Figure 6) show high poverty head counts and low inequality but inequality becomes more evident in the more urban areas, e.g. King Sabata Dalindyebo municipality (Mthatha), where the presence of some wealthier people drives the Gini coefficient up (Figure 6).



Hoogeveen and Özler (2006) lower bound poverty line adjusted to 2011 using CPI

Figure 6 Scatter plot of Gini Coefficient and Poverty headcount Ratio for local municipalities in the Eastern Cape

A similar pattern is evident in KZN where although there is a range of inequality in former homelands other parts of the province have lower poverty but higher inequality. In the Western Cape there is less poverty but quite a wide range of inequality. Gauteng generally has lower poverty and greater inequality.

The conclusion is that income poverty is highly spatially differentiated and still reflects the historical legacies of colonialism, segregation and apartheid. The highest poverty levels are in the former homelands but inequality and poverty do not have a simple relationship with each other. More sophisticated accounts are necessary to reflect the 'lived experience' of inequality.

MEASURING SPATIAL INEQUALITY – AN INTERNATIONAL PERSPECTIVE

Dr. Chris Lloyd, Department of Geography and Planning, University of Liverpool UK

Maps of deprivation indices and individual variables such as unemployment or health status provide a means of assessing the geography of inequality. Statistical measures of spatial inequalities can be used to answer questions about the spatial scale (e.g., how clustered are deprived areas?) and the magnitude of these inequalities (how large are differences between neighbourhoods?). Using census data, such measures allow the assessment of how spatial inequalities have increased or decreased over time as well as the ways in which they have changed.

England and Wales
Two indicators derived from UK census data, namely Limiting Long Term Illness (LLTI), which covers conditions that stop people participating in daily life in a normal way, and Social Rented Households were used to explore spatial scale. In Figure 7, red indicates low percentage and blue is high. LLTI shows distinct clustering in the north of England (Figure 7a) whereas social rented housing is more widely distributed (Figure 7b). There is less of a clear North South division for housing and it is these variations in spatial structure that are of interest.

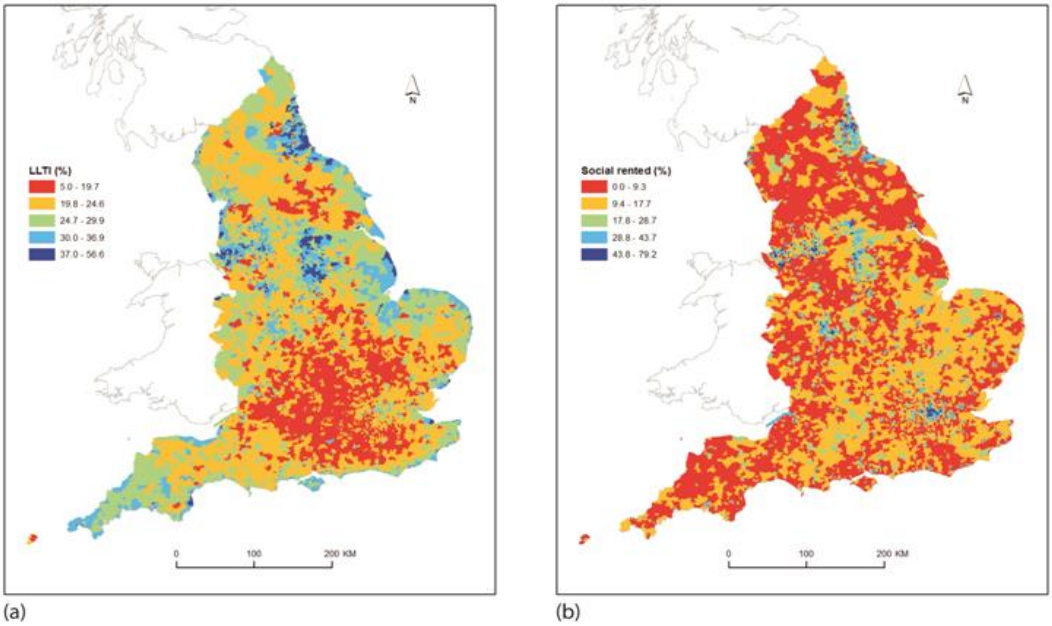


Figure 7 Health expressed as Limiting Long Term Illness (a) and Social Rented Households (b) UK 2001 census. Blue is high percentage and red is low percentage.

A common measure of population distribution is unevenness. Are inequalities the same across areas and how far are population sub-groups geographically uneven or clustered? What are the scales of geographical inequalities? Are they locally clustered or are there strong regional trends?

For Northern Ireland there is a strong East/West distinction by religion (protestant/catholic) which dates back to the seventeenth century and before. In this case the population is more spatially concentrated by religion than by a host of demographic, social and economic variables, although religious segregation has reduced between 1971 and 2011. This situation has implications for services since these are provided for both religious groups because it was thought that people would not want to share facilities.

Lloyd described three measures of population distribution: index of dissimilarity (D), Moran's autocorrelation coefficient (*I*) and the variogram.

Index of dissimilarity, *D*
Measure of spread of two groups, possible values 0-1.

0 = the groups are equally spread (e.g., all zones have a 65/35 split of two groups).
1 = the groups are completely uneven (all zones comprise entirely one group or the other).

Moran's *I* (autocorrelation coefficient)
A measure of the correlation between data values and neighbouring data values (thus, a measure of clustering).

Unlike correlation coefficient, not strictly constrained to -1, 1.

Positive values = clustering; negative values = neighbouring values tend to be different.

Variogram: spatial dependence at different spatial scales

1. Take each data value in turn and compute its squared difference from each of the other values in the data set and store the distances between them.
2. Group these differences into distance bins – e.g., all squared differences for pairs separated by 1 to 2 km and compute half of the average of these differences.
3. Plot these (half) average differences against distances.
4. The plot shows how difference between values changes as a function of distance.

These measures have been applied to England and Wales census data using the variables Age, Ethnicity, Housing tenure, Car or van access, Qualifications, Employment, National Statistics Socio-economic Classification and Health. The results were then used to find out how uneven population sub-groups are in England and Wales, how clustered these groups are, and over what spatial scales they are concentrated.

The Index of dissimilarity (*D*) was highest when comparing people who identified themselves as White with those who classified themselves as belonging to groups other than White (Table 1 red highlights). This is because initial migration settlement tends to be in cities but dissimilarity has decreased between 2001 and 2011 as people disperse to other cities. Social rented housing also shows high dissimilarity (red highlight) because this form of housing is concentrated in urban areas but there was no distinct geography for age or illness (as defined by LLTI) (green highlights).

Table 1 Index of similarity, *D*, Census Output Areas England and Wales

Variable	2001	2011	2011-2001
Age 0 to 15	0.159	0.161	0.002
Age 16 to 29	0.197	0.208	0.011
Age 30 to 64	0.110	0.102	-0.008
Age 65 plus	0.258	0.274	0.016
White Not White	0.623	0.592	-0.031
Owner Occupier	0.491	0.446	-0.045

Variable	2001	2011	2011-2001
Social Rented Housing	0.613	0.592	-0.021
Private Rented	0.384	0.371	-0.013
No Cars Vans	0.391	0.402	0.011
No Qualifications/Qualifications	0.223	0.255	0.032
EA Employed/Unemployed	0.329	0.300	-0.029
NS SEC 12	0.271	0.265	-0.006
NS SEC 37	0.239	0.207	-0.032
NS SEC 8	0.464	0.374	-0.090
Limiting Long Term Illness (LLTI)	0.197	0.199	0.002

Moran's clustering index demonstrated that for ethnicity most rural areas are homogenously White but urban areas are more mixed. Clustering has increased over time but neighbouring areas are becoming more similar and more spread across the country.

Variograms were used to explore the situation for ethnicity, social rented housing and health (LLTI). For the White/non White categories, clustering over small areas increased between 2001 and 2011 and the variance decreased indicating a strong spatial structure, but regions are becoming more similar. For Owner-occupied and Private rented households vs. Social rented households, clustering over small areas increased between 2001 and 2011, but variance decreased; this indicates much less spatial structure than for the White/non White comparison. For LLTI, there was clustering over small areas but no evidence of spatial structure; the variance increased between 2001 and 2011 indicating that regions are becoming more dissimilar.

Mapping these results shows that ethnicity has a clear urban focus (blue areas in Figure 8), for example in London and the larger cities of the Midlands. This is much less the case for housing (Figure 9) and even less for health (Figure 10).

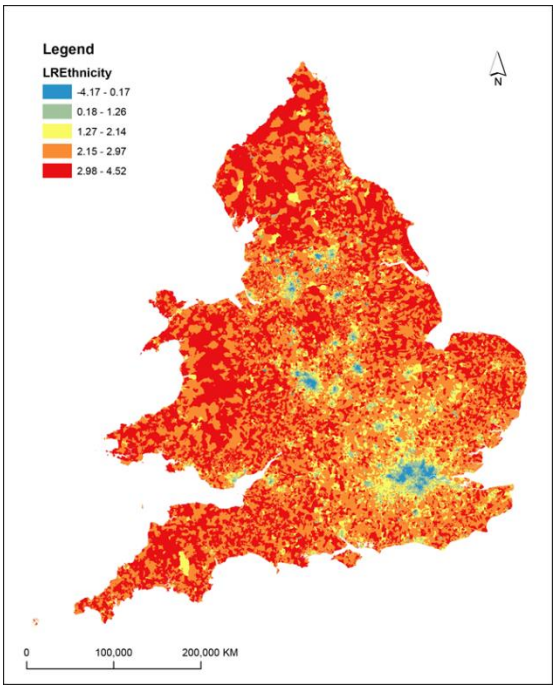


Figure 8 Log-ratio ethnicity England and Wales 2011 OAs

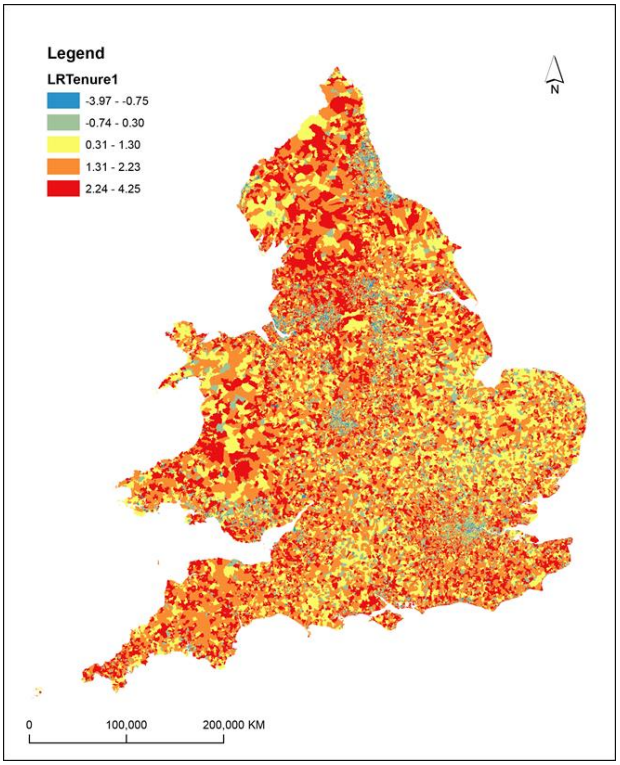


Figure 9 Log-ratio housing tenure England and Wales 2011 OAs

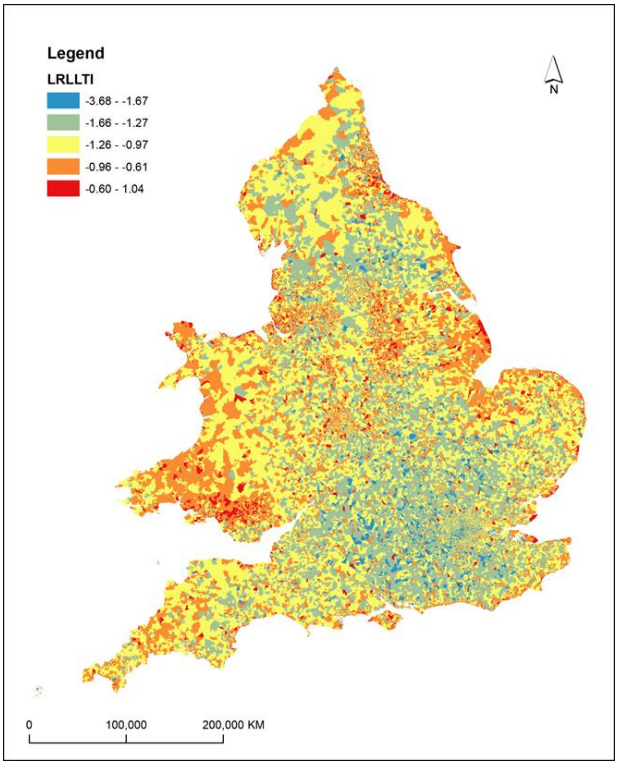


Figure 10 Log-ratio health (LLTI) England and Wales 2011 OAs

For England and Wales the age variables tend to be less uneven and less clustered than the other variables. Small levels of clustering reflect, in some cases, high levels of clustering in some areas, but high variability elsewhere – social housing is a key example. Between 2001 and 2011 unevenness in most population sub groups reduced while over the same period, there was an increase in localised clustering in the population by most of the demographic and socioeconomic variables assessed. Taken

together, the findings suggest that local areas have become more similar but, for many variables, this is against a background of reduced regional variation. In simple terms, there has been increased clustering within regions but decreased difference between regions for many population variables.

England and Wales compared to the USA

Lloyd then presented a comparison of common demographic, social and economic variables for England and Wales using the 2011 UK census and the 2012 American Community Survey. There was a broadly similar geography for the USA and England and Wales. For example, population sub-groups, i.e., white/non-white, were distinctly uneven in their distribution with more non-white people being concentrated in the urban areas.

The Dissimilarity index for USA Tracts and England and Wales Lower Super Output Areas (LSOA) was quite similar for most of the variables examined. A geographically more refined measure (1km Gaussian bandwidth) was used to provide geographic weighting to smooth the data. This allows a more robust comparison of different sized zones but it gave similar results. This means that the population in the USA and UK are distributed in very similar ways which suggests that this approach is worth pursuing.

Table 2 Spatial *D* (1km Gaussian bandwidth) for USA tracts and England and Wales (E&W) Lower Super Output Areas and Wards. Red highlights show variables demonstrating high unevenness and green is low.

	USA	E&W	E&W
	Tracts	LSOAs	Wards
Variable (vs rest)	***D***		
Age 0 to 17	0.055	0.026	0.027
Age 18 to 29	0.058	0.066	0.078
Age 30 to 64	0.028	0.021	0.019
Age 65 plus	0.065	0.110	0.113
White	0.248	0.318	0.367
Owner Occupier	0.248	0.167	0.177
No Vehicle	0.467	0.184	0.207
No Qualifications	0.122	0.129	0.125
Unemployed	0.081	0.071	0.083
Health	0.082	0.096	0.099

England compared to South Africa

The next exercise was to use the Index of Multiple Deprivation for England and Wales and compare this to South Africa. There is some North/South differentiation for England and Wales but this is nowhere near as marked as the East/West differences found in South Africa.

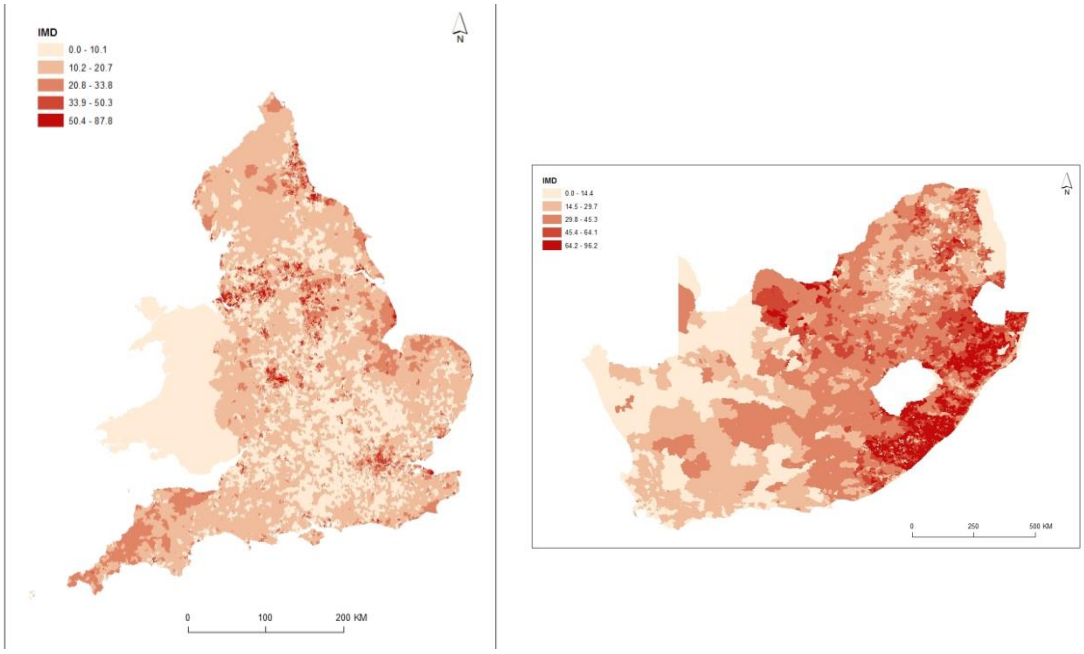


Figure 11 Distribution of IMD scores for England (left) and South Africa (right)

The variogram for England shows a very fine scale of change which confirms that there is no obvious regional spatial trend for IMD in England but the one for South Africa shows marked change (Figure 12).

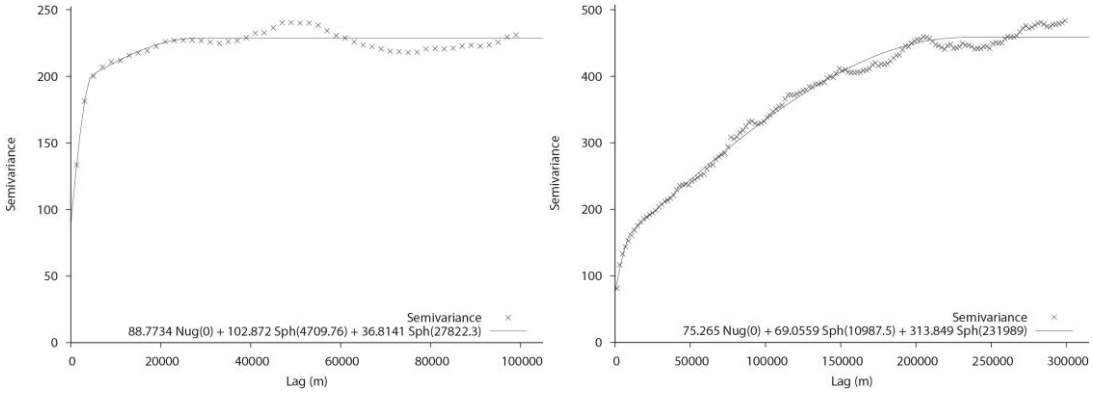


Figure 12 Variograms for the Index of Multiple Deprivation in England (left) and South Africa (right).

International comparative studies provide a means of assessing common or contrasting experiences of geographic inequalities and the ways in which they are changing. An understanding of the spatial distribution of inequalities, as well as the magnitude of inequalities, is important because scale is crucial to understanding geographic inequalities.

Q&A

Q: Adina Israel, Urban & Environmental Planner. In terms of inequality and crime data, has anyone tried correlating inequality data with crime data in South Africa? The general perception is that inequality leads to crime and if we can prove this it may influence the decision makers to develop policy that promotes less inequality.

A: Chris Lloyd. David McLennan will talk to this more directly but research has been done elsewhere. It is not just about deprivation because crime is context dependent. Detailed inequality data may help

explore the characteristics of crime but more work has to be done before we can try to relate inequality to outcomes. A solid foundation is necessary first.

Comment: Andries du Toit, Institute for Poverty, Land and Agrarian Studies. There is a disjuncture between a concern with good society and middle class fears about crime. Rising inequality is not always a bad thing. Apartheid kept inequality far apart and therefore areas were homogeneous but now we have rising local inequality as people become more integrated. I don't think you can get to the lived experience just by eyeballing the numbers.

A: Chris Lloyd. Statistical data alone cannot interpret social implications. But we can take quantitative approaches and then adapt them to individual impacts. Statistical measures of neighbourhood can be integrated with people's day to day lived experience.

Q: Eugene Ravhuanzwo, HSRC. Assuming that we all agree that inequality a bad thing, how long is it going to take to turn this around for the better? And secondly, to what extent are the social grants helping to reduce inequality?

A: Chris Lloyd. In terms of whether inequality is a bad thing, statistical measures are not enough on their own and it needs interpretation. For example, there is evidence that segregation can have advantages because it may help promote support networks.

A: Michael Noble. On the relationship between poverty and inequality, we cannot unreservedly say that equality is good if everyone is equally poor. Much depends on how you define poverty, i.e. whether we use a poverty line or definitions based on exclusion from full participation in society, which is clearly not just about a social grant. We must be careful to not just talk about Gini coefficients and use the quantitative analysis to point out where we need to go further in talking to people.

As for the social grants' impact, they have a marked impact on poverty if you use a low poverty line. They go some way to reduce poverty but do less to change inequality. Inequality is a problem of the rich and not the poor. Small social grants are a very good thing but not enough. You have to take from some and give to others – it is a zero sum and requires redistribution.

Q: Zamo Mchunu, Department of Social Development, KZN. Government has prioritised addressing poverty, inequality and unemployment at the national level. Would you put poverty at the top of the list of the three challenges? At provincial level the interventions are on poverty, what would the advice be?

A: Michael Noble. What is clear is that tacking poverty is one of the easier things to do if you adjust social grants and use low enough poverty lines. But these are only part of the solution and you have to address the inequality. You cannot rely on economic growth and trickle down to bring the poor up sufficiently to address the issue of inequality. This needs larger scale fiscal reform than there appears to be appetite for. Many big issues require a national level commitment to addressing inequality. One of the measures requires that we address unemployment to raise incomes, which requires more than the Expanded Public Works Programme can offer. We need an application of Keynesian economics which has been sadly lacking from South Africa and much of the world in recent years.

Q: Gina Weir-Smith, HSRC. Targeting of interventions is more effective if spatially defined; what is the error if one uses different size data areas? Some municipal areas vary greatly in size.

A: Chris Lloyd. We have done research on the different size of zones. If neighbouring areas are similar in size it makes little difference but if they are dissimilar it makes a big difference. For several variables the relative importance changes for different size zones. You should use the smallest areas available but even in data zones there can be considerable variation.

A: Michael Noble. We have done a lot of work on the lower levels, Super Output Areas in England and Datazones in South Africa. The challenge is now less in the UK since they moved from input geography in the census to output geography. Data are not collected in Enumeration Areas but by Output Areas designed afterwards on principles of homogeneity and equality in size. In South Africa, where input geography is still used, we have to use smoothing techniques.

SESSION 2

DEVELOPING A NEW SPATIAL MEASURE OF EXPOSURE TO SOCIO-ECONOMIC INEQUALITY IN SOUTH AFRICA

David McLennan, Centre for the Analysis of South African Social Policy (CASASP), University of Oxford

This paper explained the application of methods for measuring spatial inequality to measure how people's personal experience of inequality influences attitudes and action, including social unrest and crime. It is important not to use just any inequality measure but crucial to review international and local evidence to find measures appropriate to South Africa.

The background to this study is the South African government's recent emphasis on inequality, alongside poverty and unemployment, as one of the three core economic challenges facing the country. There is therefore a strong imperative to deepen the evidence for the relationships between inequality and outcomes.

McLennan described two projects. 'Exploring the relationships between spatial inequality and attitudes to inequality in South Africa' (UK ESRC & SA NRF funded) and 'Social cohesion: the missing link in overcoming violence, inequality and poverty' in South Africa and Brazil (Canadian IDRC & UK DFID). The first analyses the unequal spatial configuration of deprivation at small area level as a measure of people's lived experience of inequality and measures people's attitudes towards inequality and towards policy options for redress. It also tests whether people's attitudes are influenced by (or associated with) their lived experience of inequality. The second study analyses spatial patterns and trends in violent crime and potential explanatory factors – including inequality – at relevant spatial levels. It explores relationships between these factors, including examining the role of social cohesion, drawing upon both quantitative and qualitative work.

In urban areas, rich and poor often live side by side and the inequality is very obvious to all but in rural areas, although poverty may be high, there is no immediate view of affluence. There may be a contrast in people's attitudes and actions as a result of this.

Much of the existing quantitative research concerning inequality in South Africa utilises the 'classical' measures of (income) inequality such as the Gini coefficient, General Entropy measures, or the Atkinson index, and is expressed at high spatial levels (e.g. national or provincial). These measures say little about people's 'lived experience of inequality' and how this varies geographically. McLennan argued that people's experience of inequality is contoured by the geographical settings in which they live, work and travel, and understanding it requires a neighbourhood-level approach.

Residential segregation indices measure the degree to which two (or more) population sub-groups live separately from one another, at small area (i.e. neighbourhood) level and use categorical data. McLennan, Noble & Roberts developed a range of indices to measure segregation between the 'poor' population and the 'non-poor' population (i.e. a dichotomous classification) across the whole of South Africa. The aim was to develop a measure of residential segregation that reflects people's lived experience of inequality in South Africa. It required a dataset that counts the number of 'poor' people and the number of 'non-poor' people for each neighbourhood across the whole of South Africa.

The South African Index of Multiple Deprivation (SAIMD) at datazone level,[1] and specifically the 'Income and Material Deprivation' domain, provides suitable data. In the SAIMD people are classified as suffering income and material deprivation if they meet one or more of the following criteria:
(i) 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; or
(ii) living in a household without a refrigerator; or
(iii) living in a household with neither a television nor a radio.

There is marked spatial inequality in Johannesburg where the Northern suburbs are wealthy and the Southern suburbs tend to be poorer. There are also pockets of poverty close to wealthy areas such as Alexandra next to Sandton. In contrast, an area such as King Sabata Dalindyebo municipality (Mthatha), in the former Transkei, is predominantly poor with just a few pockets of wealth in the urban area.

Massey & Denton (1988) identified five dimensions of residential segregation and gave a number of statistical measures of each dimension. The measure are: evenness, exposure, concentration, centralisation, and clustering. The *P** Exposure indices measure the extent to which members of one population sub-group are exposed to members of another sub-group. These measures represent the likelihood that individuals will be exposed to people from the other end of the socio-economic spectrum as they go about their daily lives and may be regarded as proxies for an individual's 'lived experience of inequality'. There are different variants: 'global', 'geographically weighted' or 'local' but the 'local' variant gives the greatest geographical nuances. For the purposes of this study it was assumed that 'exposure' is primarily contoured by people's routine daily activities.

This then poses the question 'How do we set the spatial bounds for daily routine within which people may be exposed to inequality?' And 'How do we estimate the likelihood of a person visiting all the neighbourhoods in that area?'

A case study of datazones in Khayelitsha, Cape Town, where 95% are poor, was used to explain the concept. If we map where people are most likely to travel and why, a 1km radius exposes people to neighbourhoods that are very similar to their own. A 5km radius introduces more heterogeneity and a 10km radius is more varied again. Twenty kilometres brings in the wealthier southern suburbs but excludes the city centre. This calls for a research judgement and there is no entirely scientific method. When deciding how likely a resident is to travel to the different neighbourhoods there are various methods available, e.g. exponential distance decay, linear distance decay or modified distance decay.

For exponential distance decay the likelihood drops off very quickly, so this was rejected. Linear distance decay provided a starting point but likelihood of visits is determined by function and not just distance. The patterns are contoured by needs (work, study, local administrative function), opportunity (seeking work) and barriers (physical, cultural, safety concerns). It is assumed that affluent areas provide more pull than poor areas. Using a combination of distance and function gives a better picture and the likelihood of visiting other neighbourhoods is best described by 'deprivation adjusted linear distance decay' – see Figure 13 and Figure 14.

In summary, the proposed exposure measure is dependent upon the two inter-related factors of:

1. The likelihood of a given person from a given neighbourhood visiting each separate other neighbourhood within the defined spatial bounds; and
2. The likely level of exposure to inequality the person would experience in each of those separate other neighbourhoods.

[1] Datazones are a statistical geography covering the whole of South Africa. Datazone populations range from 1,000 to 3,000 with a mean of 2,000. There are approximately 22,000 Datazones across South Africa.

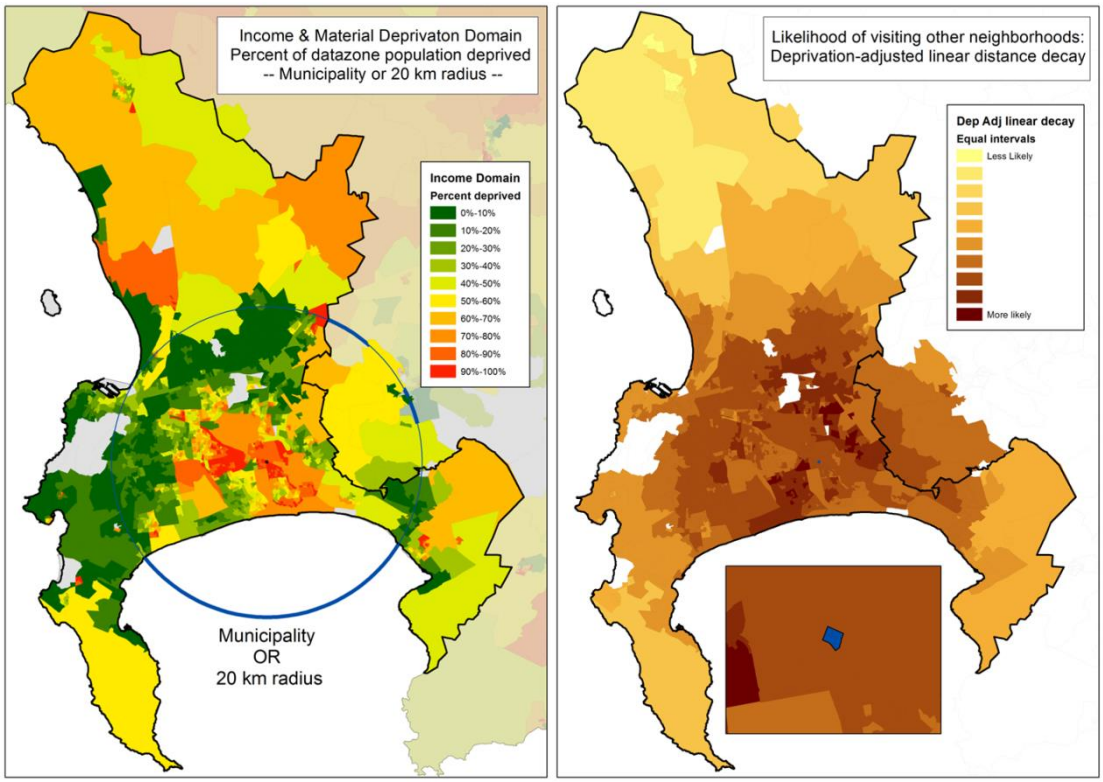


Figure 13 Case Study: Khayelitsha, Cape Town (>95% deprived) blue highlight. (a) Income and Material Deprivation Domain, Percent of Datazone deprived. (b) Likelihood of visiting other neighbourhoods: Deprivation-adjusted linear distance decay.

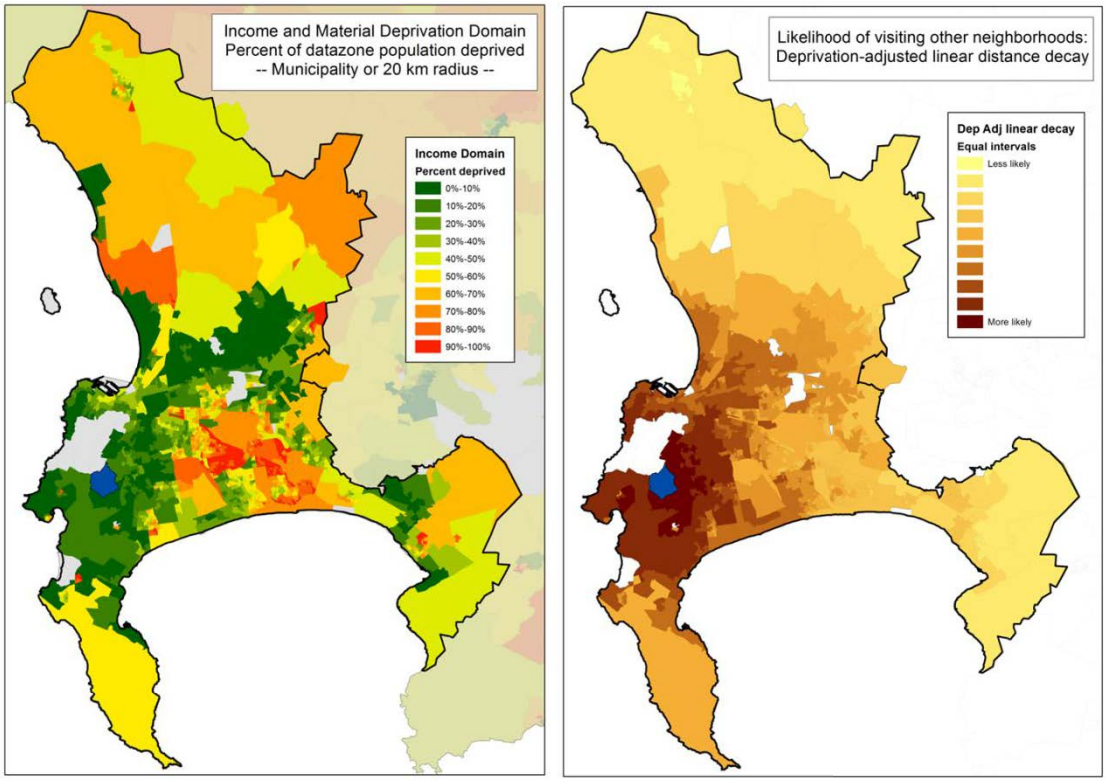


Figure 14 Case Study: Constantia, Cape Town (<5% deprived) blue highlight. (a) Income and Material Deprivation Domain, Percent of Datazone deprived (b) Likelihood of visiting other neighbourhoods: Deprivation-adjusted linear distance decay.

Exposure indices measure the degree of likely interaction between different population sub-groups. They measure the degree to which the poor population is exposed to the non-poor (i.e. the lived experience of inequality from the perspective of the poor) and the degree to which the non-poor population is exposed to the poor (i.e. the lived experience of inequality from the perspective of the non-poor). 'Local' measures of exposure provide a geographically nuanced picture of variations at neighbourhood level.

Q&A

Comment: Andries du Toit, PLAAS. Once you start looking at these travel patterns you are no longer measuring local level inequality but something else. I was wondering whether it is feasible to place assumptions on actual travel data, for example commuter patterns. We have data on commuter miles and travel route data for Cape Town.

A: David McLennan. The measure is already quite complex but travel patterns would be useful and we do need more data. We have been in contact with the Gauteng Observatory which has quality of life data for urban areas but we need more rural data. The 20km radius is a starting point but we need a defensible position to modify it.

Q: Josh Budlender, SALDRU. Is distance related to the nature of the economic activity? Does it apply equally in rural areas and what about migrant labour in rural areas? Do you have to have a fixed cut off? Considering the extent to which media exposes people to each other, do you consider this aspect?

A: David MacLennan. Migrant labour is an important point and of course some activities are not daily but occur over longer periods. This is very hard to measure but we should at least recognise this aspect. Media is probably a step too far but it affects everyone.

C: Alize Le Roux, CSIR. You cannot ignore the issues around transport data. Some people travel 50 or 60 km for employment and some services are brought in beyond 20 km. You also need to consider commuter towns with no employment opportunities.

THE RESULTS: HOW DOES A PERSON'S EXPOSURE TO SOCIO-ECONOMIC INEQUALITY VARY SPATIALLY ACCORDING TO WHERE THEY LIVE?

David McLennan, CASASP, University of Oxford

Approximately 70% of South Africa is defined as poor, so this category covers the vast majority of the population. Figure 15 shows the national distribution of exposure values of poor to non-poor highlighting the greatest exposure in Gauteng and the Western Cape. There is a broad inverse correlation to the poverty rates and exposure to poverty but the relationship is not a simple one.

Examining the 22 000 datazones revealed a bimodal exposure of the poor to the non-poor by metropolitan and non-metropolitan datazones. Exposure to inequality is high in metropolitan datazones and lower in non-metropolitan ones. When examining the 10% of datazones with the highest exposure, shown in blue in Figure 15, the vast majority are in the four major metropolitan municipalities, namely, Cape Town (44.5%), Tshwane (22.7%), Johannesburg (13.1%) and Ekurhuleni (9.3%). When examining the proportion of datazones within the 10% highest exposure category by municipality (
Table 3), Cape Town has 71% of its datazones in the highest exposure category.

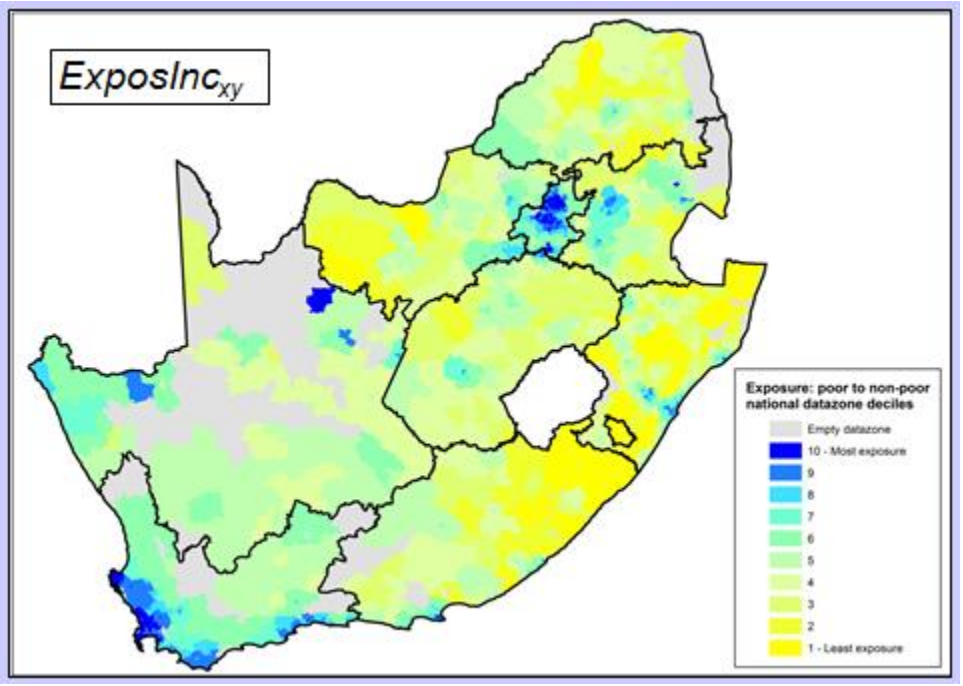


Figure 15 Exposure of poor to non-poor for South African datazones.
Blue = most exposure, yellow = least exposure

For Johannesburg the poor are exposed to most inequality in the northern suburbs. If you are poor and live in Soweto, levels of exposure are lower than the northern suburbs but still high relative to the rest of the country. Exposure is higher in Alexandra than in Soweto. For Mthatha in the Eastern Cape

Table 3 Exposure of poor to non-poor: location of the 10 municipalities with the largest proportions of datazones in the highest *ExposInc$_{xy}$* decile nationally

Municipality	Number of datazones in the municipality	Number of datazones in the 10% highest *ExposInc$_{xy}$* decile nationally	Percentage of municipality datazones in the 10% highest *ExposInc$_{xy}$* decile nationally
Gamagara	9	7	77.8%
Stellenbosch	60	44	73.3%
City of Cape Town	1388	986	71.0%
Saldanha Bay	34	23	67.6%
City of Tshwane Metro	951	502	52.8%
Mossel Bay	37	10	27.0%
City of Johannesburg Metro	1599	290	18.1%
George	67	12	17.9%
Ekurhuleni Metro	1188	206	17.3%
Nokeng tsa Taemane	21	3	14.3%

exposure to inequality is low relative to the rest of the country but it is still higher in the town and the areas around Mthatha than the broader area. This gives a sense of how exposure varies between major metropolitan areas and more rural areas and how exposure can vary within a metropolitan area.

All these analyses are based on income deprivation but an ongoing project is looking at the exposure index against the other domains of deprivation, namely employment, education and living environment.

Figure 16 shows the spread of neighbourhood exposure scores for metropolitan areas according to the four deprivation domains, arranged in descending order of exposure from left to right. Generally, Cape Town, Tshwane and Johannesburg appear on the left, i.e. have high exposure to inequality, and the smaller metropolitan municipalities, e.g. Buffalo City, appear on the right with lower exposure to inequality.

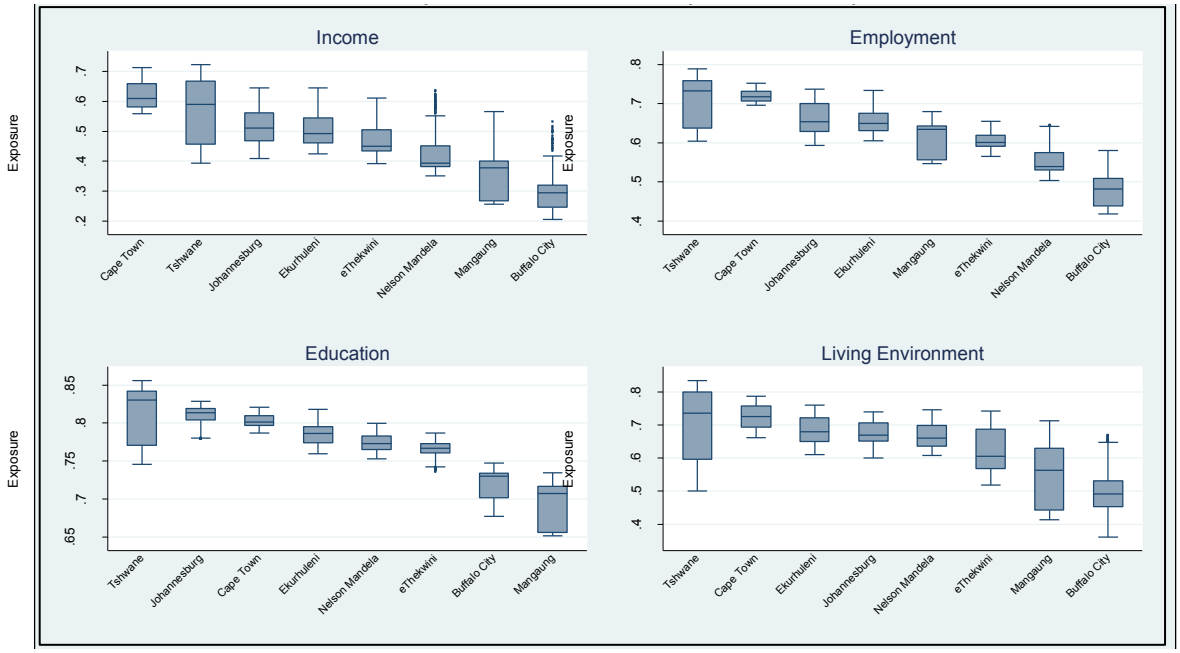


Figure 16 Exposure scores - metropolitan municipalities

In order to better capture the lived experience of inequality it is necessary to develop a composite indicator which includes all the domains since people may experience inequality in several domains. A composite measure of exposure was produced using factor analysis and the 7 800 metropolitan datazones were re-ranked on the $ExposFac_{xy}$ measure (Figure 17).

This plot shows much greater variability within Tshwane than Cape Town, suggesting that Tshwane is much more heterogeneous than Cape Town. This composite indicator allows some differentiation between municipalities. Mapping the within-metro composite exposure factor deciles for Cape Town shows that while the poor are highly exposed to inequality in the wealthier parts of the city this drops off rapidly as one moves away from the wealthier parts.

To summarise the exposure results, we can say:

- Exposure to socio-economic inequality is typically highest in the urban areas, particularly the metropolitan municipalities.
- There are strong correlations at datazone level between the four separate dimension-specific measures of exposure (income, employment, education, living environment).
- The composite $ExposFac_{xy}$ measure for metropolitan datazones shows that exposure is typically highest in Tshwane and Cape Town, but that there is far more variation within Tshwane than within Cape Town.
- The exposure results can be analysed at a detailed geographical level to explore variations within municipalities.

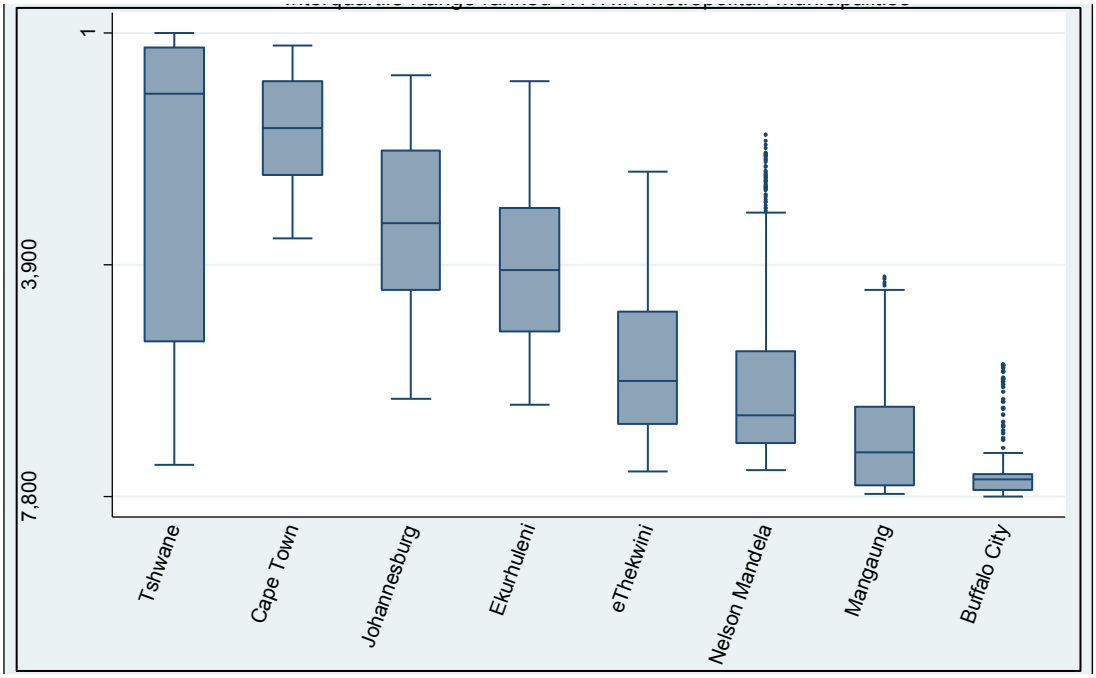


Figure 17 Datazone Exposure Factor Ranks by Municipality: interquartile range ranked *within* Metropolitan Municipalities

These exposure measures are from the perspective of an individual poor person but the team has also looked at neighbourhoods with many poor people experiencing extreme inequality exposure on a daily basis. It could be argued that places exposed to the twin stresses of very high poverty and very high exposure may be predisposed to social unrest and violent crime which will be the subject of further analysis.

Q&A

Q: Adina Israel, Urban & Environmental Planner. Would food security be something to include for rural areas when compared to urban? In the Eastern Cape or Limpopo people may be growing their own food whereas in Khayelitsha they have to rely on markets and suffer additional stresses from overcrowding which could contribute to social unrest.

A: David McLennan. There are other potential indicators and any meaningful measure can be fed into the same methodological framework. Whether food security could be measured has to be determined.

Q: Andries du Toit, PLAAS. I am deeply troubled. You cannot deduce lived experience from this kind of data. It captures 'exposure' but not 'lived experience'. Apartheid reduced exposure to inequality and I think you are missing so many other things such as local fiscal resources. What does the municipality give money to and what not?

A: David McLennan. This is not meant to be the be all and end all. We see this as part of the evidence base alongside qualitative work which is important to qualify the assumptions. We can say we have potential results from the quantitative work which require further interrogation.

Comment: Gemma Wright, SASPRI. A recent project has explored how dimensions of inequality impact on dignity in rural areas. Young women in rural areas spoke about their peers from school who had achieved better standards of living whereas in urban areas there was a more acute depiction of being at the sharp end of inequality, e.g. a domestic worker cleans a house with many toilets but does not have one in their own house. Sanitation was raised as one of the main issues in inequality in this context.

A: Ben Roberts, HSRC. Regarding Andries' concerns, the broader aim is to look at the effect of exposure on people's attitudes and 'Exposure' was seen as the best of the Massy & Denton typology criteria for our purposes.

Q: Gina Weir-Smith, HSRC. Can you explain why a small municipality such as Gamagara in the Northern Cape should have the highest exposure to inequality (Table 3)?

A: Gamagara has a huge mining development on one side and extreme poverty on the other. It is also a former homeland and many people do not have the necessary skills for employment. Some people also received large cash settlements from the mine which has made the situation there quite extreme.

SESSION 3

ARE PEOPLE'S ATTITUDES TOWARDS INEQUALITY AND OPTIONS FOR REDRESS INFLUENCED BY THEIR EXPOSURE TO INEQUALITY?

Ben Roberts, HSRC & David McLennan, CASASP.

This presentation looked at how the exposure to inequality measure relates to public perceptions, general beliefs and preferences for change, particularly in terms of state-led initiatives. The study draws on the South African Social Attitudes Survey (SASAS) which is a longitudinal study that has been running since 2003. Approximately 7 000 people are interviewed using a set of core questions and about 3 500 each answering two versions of the questionnaire covering different themes each year.

The 2009 version of SASAS included a module on social inequality. The one dependent variable is a classic 'inequality aversion measure' using the question 'To what extent do you agree or disagree that differences in income in South Africa are too large?' The second addresses preferences for state led redistribution based on the question 'To what extent do you agree or disagree that it is the responsibility of the government to reduce the differences in income between people with high incomes and those with low incomes?' The analysis then explored what role, if any, exposure to inequality plays in shaping people's responses to these two questions.

Between 2003 and 2011 the vast majority of respondents (>83%) agreed that 'income differences in South Africa are too large' and this proportion has remained fairly stable over the period. In terms of preference for redress, the majority were in agreement that this is the government's responsibility but there has been a slight decline over time (78 to 66%).

Data preparation required linking data from SASAS with Exposure to Inequality at datazone level and this was done using census enumeration areas. Next, a 'manageable' number of control variables in the SASAS dataset that were relevant to the comparison were selected. These included themes such as demographics; objective personal life status; subjective personal life status and dynamics; perceptions of inter-group societal tensions; views on individualistic vs structural factors underpinning success; political views; and geographical identifiers. The third task was to decide the basis for splitting SASAS into 'rich' and 'poor' sub-sets. This was done using the Income and Material Deprivation domain of the South African Index of Multiple Deprivation (SAIMD) 2001.

According to the SAIMD 2001, 73% of South Africa can be classified as income and materially deprived, i.e. 'poor', and 27% not deprived or 'non-poor'. SASAS contains a series of questions relating to material asset ownership to produce an 'asset index' and this was used as a proxy to split the sample into the 73% lowest asset ownership as the 'poor' SASAS subgroup (2 110 cases, based upon cumulative benchweight values) and the 27% highest asset ownership or 'non-poor' SASAS subgroup (1 036 cases, based upon cumulative benchweight values).

Model development followed the procedure described by Greenland (1989).[2] The process starts with a full complement of explanatory variables in the base modelling file and then sequentially drops one variable at a time based upon the likelihood ratio (LR) test *p*-value until each variable remaining in the model has an LR *p*-value <0.05. With the exception that explanatory variables relating to experience of inequality and neighbourhood poverty rate and the interaction term between them would be retained in the model regardless of LR test *p*-value. Interaction terms containing exposure or poverty rate are then added sequentially if the associated LR test *p*-value for the interaction is <0.05.

Table 4 shows the four models that were developed with the independent variables of 'Inequality Aversion' and 'Appetite for government redress' being examined for the 'poor' and 'non-poor'. The focus of this presentation was on models A and C, i.e. the attitudes to inequality and redress from the perspective of the poor.

Table 4 Model matrix showing the dependent variables and poor/non-poor perspectives for each

		Poor/non-poor perspective	
		Poor	Non-poor
Independent variables	Inequality Aversion	Model A	Model B
	Appetite for government redress	Model C	Model D

Model A – inequality aversion amongst the poor subgroup
There was a significant relationship between the interaction terms *Exposure to Inequality * Perceived Social Mobility* and *Exposure to Inequality * Expectations of Social Mobility* (see Table 5).

Table 5 Model A: neighbourhood-level poverty and exposure variables, plus relevant interactions

Parameter	Estimate	Std. Error	z value	Pr(>|z|)	Sig.	OR	OR 95% CI lower	OR 95% CI upper	Group LR test pval
(D) Neighbourhood level poverty and exposure variables and interactions									
Neighbourhood poverty rate	0.12	0.11	1.13	0.2600		1.13	0.91	1.40	
Exposure to inequality	0.25	0.17	1.50	0.1300		1.29	0.93	1.79	
Neighbourhood poverty rate * Exposure to inequality	0.01	0.08	0.09	0.9300		1.01	0.86	1.17	
Neighbourhood poverty rate * Household size	-0.13	0.05	-2.58	0.0099	**	0.87	0.79	0.97	
*Exposure to inequality * Perceived social mobility history (Ref='Upward mobility')*									*0.0120*
Exposure * No mobility	-0.09	0.12	-0.76	0.4500		0.91	0.72	1.15	
Exposure * Downward mobility	-0.38	0.13	-2.84	0.0044	**	0.68	0.52	0.89	
*Exposure to inequality * Expected future social mobility (Ref='Improve')*									*0.0037*
Exposure * Stay the same	0.13	0.13	1.00	0.3200		1.13	0.89	1.45	
Exposure * Worsen	0.04	0.14	0.31	0.7600		1.05	0.79	1.39	
Exposure * Uncertain	-0.65	0.20	-3.18	0.0014	**	0.52	0.35	0.78	

* significant at p < 0.05; ** significant at p < 0.01; *** significant at p < 0.001

Both exhibit negative associations with exposure, meaning that, as exposure increases, respondents in these two groups show progressively less aversion to income inequality than the respective reference groups. This suggests some sense of disillusion among the downwardly socially mobile as aversion becomes closer to the 'no social mobility' group with more exposure.

Model C – agreement amongst the poor subgroup that government has a responsibility for income redistribution
In common with the first model there was no significant relationship between poverty or exposure to inequality but two interaction terms were significant. These terms were *Exposure * Employment*

[2] Greenland, S, 1989. Modelling and variable selection in epidemiologic analysis. *American Journal of Public Health*, 79 (3): 340-349.

status (with reference to those full time employed) and *Exposure * Self-rated poverty status* (with reference to those who rated themselves as wealthy or very comfortable) (Table 6).

Table 6 Model C: neighbourhood-level poverty and exposure variables, plus relevant interactions

Parameter	Estimate	Std. Error	z value	Pr(>|z|)	Sig.	OR	OR 95% CI lower	OR 95% CI upper	Group LR test pval
(D) Neighbourhood level poverty and exposure variables and interactions									
Neighbourhood poverty rate	0.01	0.11	0.12	0.9000		1.01	0.82	1.25	
Exposure to inequality	-0.49	0.29	-1.69	0.0920	.	0.61	0.35	1.08	
Neighbourhood poverty rate * Exposure to inequality	-0.11	0.08	-1.38	0.1700		0.90	0.77	1.05	
*Exposure * Employment status (Ref='Employed full time')*									*0.0045*
Exposure * Employed part time	0.75	0.22	3.32	0.0009	***	2.11	1.36	3.27	
Exposure * Unemployed, seeking work	0.12	0.15	0.84	0.4000		1.13	0.85	1.51	
Exposure * Unemployed not looking for work	0.40	0.19	2.07	0.0390	*	1.50	1.02	2.19	
Exposure * Pensioner	0.18	0.19	0.93	0.3500		1.20	0.82	1.74	
Exposure * Student/learner	0.18	0.18	0.96	0.3300		1.19	0.83	1.70	
Exposure * Permanently sick/disabled	0.90	0.39	2.32	0.0200	*	2.45	1.15	5.23	
Exposure * Other employment status	0.67	0.28	2.45	0.0140	*	1.96	1.14	3.37	
*Exposure * Self-rated poverty status (Ref='Wealthy/very comfortable')*									*0.0020*
Exposure * Reasonably comfortable	0.02	0.28	0.08	0.9300		1.02	0.59	1.78	
Exposure * Just getting by	0.58	0.26	2.19	0.0290	*	1.78	1.06	2.99	
Exposure * Poor	0.32	0.27	1.19	0.2300		1.38	0.81	2.33	
Exposure * Very poor	0.36	0.30	1.19	0.2300		1.44	0.79	2.60	

* significant at p < 0.05; ** significant at p < 0.01; *** significant at p < 0.001

Plotting Exposure against Employment status (Figure 18) shows a positive relationship for those employed part time, unemployed but not looking for work, the permanently sick or disabled and the category 'other employment status'. This is consistent with a sense of income vulnerability, particularly among those who are more vulnerable in the labour market.

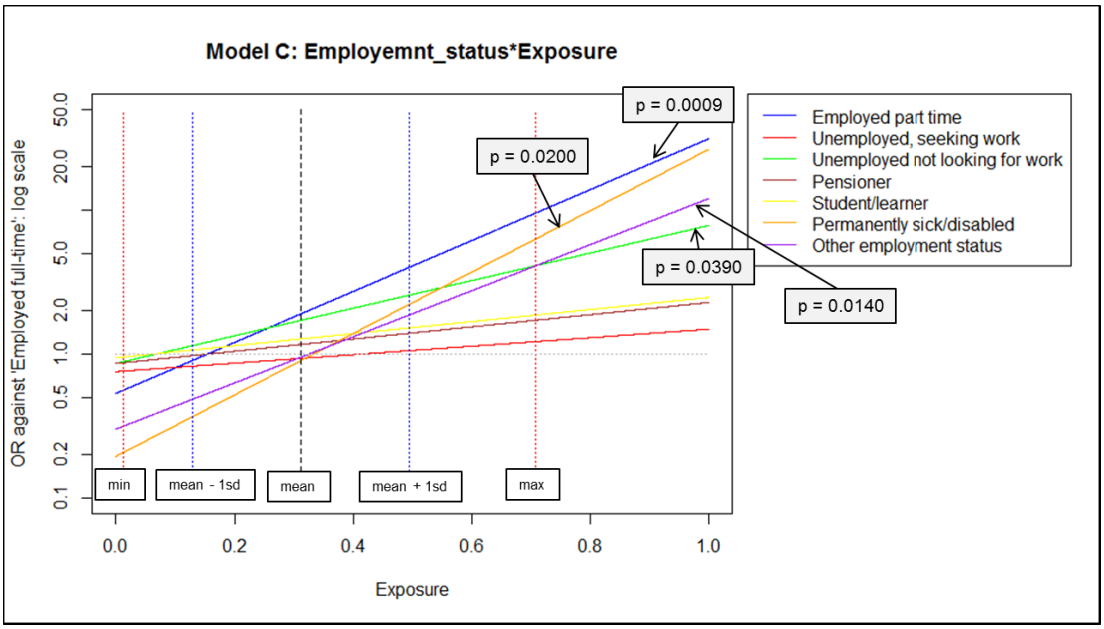


Figure 18 Model C: government redistribution, poor subgroup.
Exposure to inequality * Employment status

For 'self-perceived poverty status' by Exposure in comparison with those who consider themselves wealthy or comfortable (Figure 19), only those who rate themselves as 'just getting by' were significantly different from those who were comfortable.

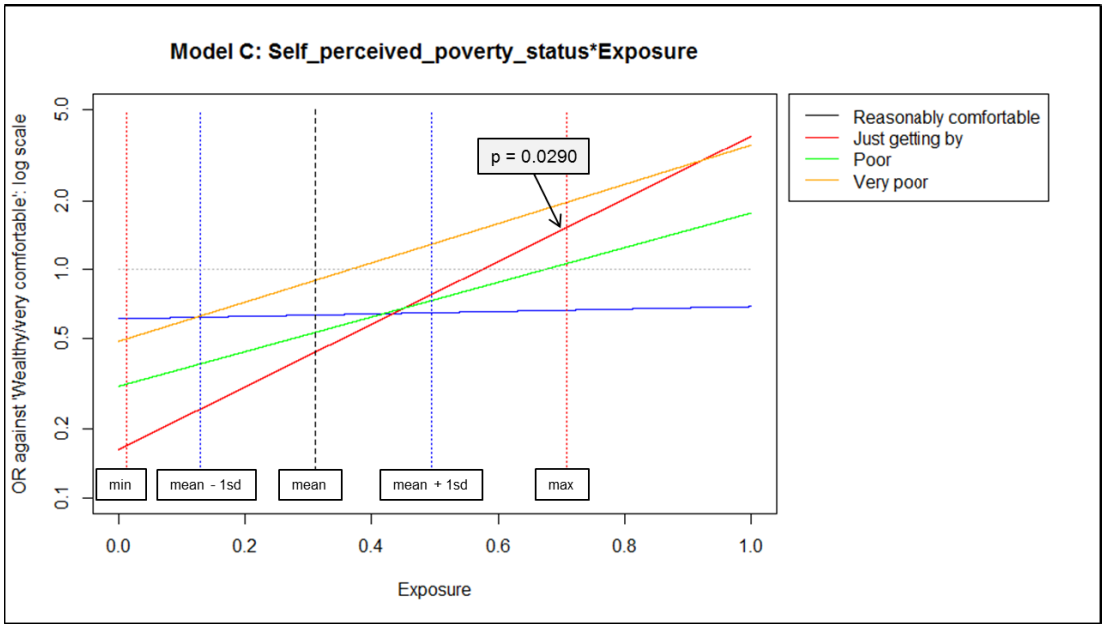


Figure 19 Model C: government redistribution, poor subgroup.
Exposure to inequality * Self-perceived poverty status

In Model C, all five of the statistically significant interactions exhibit positive associations with exposure, meaning that, as exposure increases, respondents of these five groups become progressively more supportive of government's role in income redistribution relative to the reference categories. However, all five interactions suggest that at the lowest actually observed exposure level, people in these groups are less supportive than the respective reference group (although the odds ratios for some of the employment status groups are only slightly below 1 at the low-exposure extreme).

These statistical models were designed to test whether exposure to socioeconomic inequality affects attitudes to inequality and options for redress. The basic hypothesis is that exposure to inequality leads to heightened awareness of inequality, which leads to an increased sense of social injustice, which leads to greater aversion to income inequality and a stronger belief that the government has a responsibility to reduce inequality through income redistribution. The models demonstrated that exposure to inequality *does* seem to exert some effect on people's attitudes to inequality and options for redress, but the effects are primarily observable through the interaction of exposure with other explanatory variables. A limitation of the data is that there is generally a strong consensus amongst survey respondents that inequality is too high and that the government has a responsibility to reduce it through income distribution. Therefore there is not a great deal of discrimination between response categories on the two dependent variables. A recommendation is to consider additional SASAS questions to provide greater discriminatory power between response categories.

This project, the *ESRC Pathfinder Inequality* project, is experimental in conception and fairly focused in scope. Apart from contributing to a better understanding of inequality based on the development of new small area inequality measures and an in-depth examination of attitudes towards inequality in the country, the study is an example of the utility of combining different types of data to produce new insights about the intersection of inequality, space and social beliefs. There is clearly a need for further experimentation of this type to produce policy-relevant evidence of the interplay between spatial inequality and citizen attitudes, as well as other aspects of social life and its dynamics.

Q&A

Q: Chris Lloyd, University of Liverpool. Have you considered whether the relationship between exposure and these other variables is linear? Have you tried any transformations?

A: Ben Roberts, HSRC. We have not tried moving from linear to non-linear relationships. It is perhaps the next iteration of this work. The dataset is to be placed in the public domain, so others can try alternative assumptions and see if this produces different results.

Comment: Gemma Wright, SASPRI. These high levels of aversion to inequality and the belief that government should redistribute wealth are important findings for South Africa and, although they present challenges for modelling, they express solidarity that should be celebrated.

A: Ben Roberts. These results do speak to the character of our society and we see quite strong views expressed about the two dependent variables. South Africans are inequality-averse and generally expect the state to take a role in changing the situation. There has been some decline over the last 10 years but people are still very resolute about this.

SESSION 4

ARE NEIGHBOURHOOD CRIME RATES INFLUENCED BY RESIDENTS' EXPOSURE TO INEQUALITY?

Panel: Chris Lloyd; Hangwelani Hope Magidimisha; David McLennan; Ben Roberts; Robert van Niekerk

The final session set about trying to explore whether this inequality exposure variable can be linked to crime or other outcomes. Panelists provided brief inputs on recent or current work which were considered relevant to the debate.

Ben Roberts, HSRC: Safe Cities Project
The Safe Cities Project is one of four such projects funded by IDRC and DFID. The HSRC one is entitled *Social cohesion: the missing link in overcoming violence and inequality.* There is a broad range of stakeholders and research partners involved including South Africa, Brazil and the UK.

The study seeks to test the hypothesis that social cohesion can help explain why violence occurs and how to prevent it. The study will involve several firsts for empirical research. It will map links between violence, inequality and poverty; it will aim to compare data from South Africa and Brazil; it will attempt to use ethnographic data to explain the impact of fear of crime on social and civic cohesion; and it will compare two specific interventions to see whether they are breaking the link between violence, inequality and poverty, in Rio de Janeiro and Khayelitsha.

The quantitative side includes an overview of statistics on poverty and violent crime spatially; the influence of inequality on spatial distribution of violent crime; and to probe attitudinal perspectives on crime, fear of crime and social cohesion more fully than in the past. The project is about half way through and data collection is nearly complete.

Hope Magidimisha, HSRC: Measures of spatial inequality and service delivery.
Hope Magidimisha used SAIMD and SASAS data in a case study for Limpopo. The focus was the environmental domain of SAIMD which is largely about service delivery. The study sought to find people's views in different municipalities where performance often varies even within the same district.

The study found that it is easy to point fingers at the government for not delivering services but on closer examination it appeared that the situation was not straightforward. The municipality was willing to provide water and sanitation but could not do so in mountainous areas and therefore required people to relocate. However, communities do not want to move from where their ancestors are buried and so they end up not getting services. Subsequently, the municipality offered protection of rivers and springs but community members removed the protection apparently claiming that it was unacceptable to their ancestors. Thus the cultural variable is powerful enough to derail good intentions.

The study also looked at attitudes to municipalities. It seems surprising that most people without services do not protest but in Gauteng, even though people have more services, protest action is greater. In rural areas little has changed. Conservative values appear to prevent rural people from going on strike or protesting.

In rural areas people have greater faith in their traditional leaders than municipal officials because the Chiefs do not make promises and then fail to deliver. Similarly, the Chief does not trust the municipality because they often 'break their promises' and therefore he may be reluctant to allow them to come and put water pipes in. He fears that people may blame him if the municipality fails to deliver and he may lose power as a result.

David McLennan, CASASP: Recent work on measuring crime.
If you look at Alexandra, for example, residents are highly exposed to poverty *and* inequality – and our suggestion is that it is this combination of factors acting together that creates crucial crime-generating factors, over and above what you have from either poverty on its own or exposure to inequality on its own. To examine this a 'Neighbourhood intensity of exposure to inequality' index was calculated from the interaction between poverty and exposure to inequality.

South Africa has one of the highest violent crime rates in the world but is this related to inequality? Using a study of Liverpool, where detailed crime statistics are available by location, it is possible to create a map of crime occurrence and there is clear spatial differentiation. Small area data on crime is necessary to look at the relationships between crime and potential crime-generating factors. South African crime data is available for research purposes at police station level but the underlying docket data, which should contain specific locational data that would allow mapping of crimes, is not made available yet.

McLennan found that the areas with highest deprivation and poverty have the lowest rates of crime, which is not what was expected. There is a high overall crime rate in the wealthier parts of Johannesburg but lower in Alexandra. However, property crime is lowest in Soweto and Alexandra while murder is high in Alexandra. So there appears to be a distinction between property crime and violent crime. However this may be due to different reporting rates and they are looking into this. This is an early stage of the analysis, but the hypothesis is that the high crime rate in Alexandra may be potentially driven by the combination of high poverty rates and high exposure to inequality rates. If that relationship does stand up, why does it stand up? How does inequality and exposure to inequality flow through to become a crime-generating factor, and is it, for example, through effects on social cohesion in these neighbourhoods?

Panel and Audience discussion on the way forward

Q: Masana Ndinga-Kanga, UCT Poverty & Inequality Initiative. One of the problems is that there is no agreed definition or index for social cohesion. This has implications for how we understand poverty and inequality and crime. So we are in the process of constructing an index but there are some limitations with the given data. Perhaps that is a conversation that we should have.

The focus of Safe Cities is urban but we are also looking at rural areas and levels of cohesion. In this case were are interested in exploring the dynamics of land ownership and land tenure and social cohesion.

Finally, the StatsSA crime statistics include questions about what people do in the event of crime, whether they report it and whether they trust the police. This could have relevance to the differences observed between townships and the more affluent areas.

Q: Richard Matzopoulos, UCT/MRC. My concern is whether crime statistics are the right way to measure crime geographically. In many cases crime takes place in another precinct and it does not relate to the population at risk. A survey may be a better tool. In terms of completeness, murder is

the gold standard but we need to look at the residential address of the deceased and not where they died. Burglary is perhaps a better proxy at neighbourhood level.

In terms of the proximity of poor to rich people, is there an interplay between the services provided in wealthy areas that may lead to better reporting of crime?

A: David McLennan. Safe Cities is urban but we are interested in rural areas too and would like to discuss this further. We recognise the difficulties in measuring social cohesion. Samson's theory takes this further in terms of 'collective efficacy' but his work was based on US datasets which provide a level of detail that simply is not available elsewhere.

Regarding victims of crime, trust in the police and its influence on reporting of crime, the StatsSA Victims of Crime Survey does look at people's propensity to report. We are currently looking into this.

Regarding the point about whether crime statistics are the best source of data, in the UK, police-recorded crime statistics are standardised and audited but they are still being criticised extensively. So we must recognise their limitations. Survey data has limitations imposed by sample size that create large confidence intervals and unless repeated every year will lack information. Crime statistics are a useful starting point.

Richard highlights a very important point about whether we are we interested in the location of the crime or the location of the victim or the perpetrator. All three are important. We are taking this on board in our project.

Better service availability may influence reporting and we are looking into potential under-reporting of crime, particularly in rural areas.

Comment: Lizette Lancaster, Institute for Security Studies. There are problems with under-reporting and it is linked to the types of crime. There are good reporting rates for murder and vehicle theft and but less for assaults and rape. You need to decide which crime types are the best for this type of analysis.

Sandton is an unfortunate example as are any Central Business Districts because of their low night time population and high daytime population; when these populations intersect we get high crime. Also crimes are not evenly distributed across precincts and certain types of crime can be very localised. When you start looking at the different crime dynamics and which type of crimes feature you do see many distinct patterns.

When looking at traditional communities in rural areas, reporting of crime differs and there are different ways of dealing with crime. As much as there are flaws in reporting, the report of the Khayelitsha Commission of Inquiry into policing[3] has a lot of information on service delivery. There are many permutations and we must not oversimplify the variables.

Comment: Gina Weir-Smith, HSRC. In terms of the spatial context of crime, a previous national study on arrestees found that South African perpetrators travel much further to commit crime than international data suggest. There was a clear disjuncture between where the perpetrator stays and where the crime takes place, which is something else to take into consideration.

A: David McLennan. It would be good to see that research and it would be interesting to see how non-reporting and distance could be related.

[3] O-Regan, C, Pikoli, V, Bawa, N, Sidaki, T. 2014. *Towards a Safer Khayelitsha: The Report of the Commission of Inquiry into Allegations of Police Inefficiency and a Breakdown in Relations between SAPS and the Community in Khayelitsha.* http://www.saflii.org/khayelitshacommissionreport.pdf

Chris Lloyd, University of Liverpool
The main focus of the day has been the exposure to inequality work, which is really important, and how exposure might be used.
1. Exposure and crime is often about the mixing of people with different characteristics and whether you need a different kind of exposure measure for crime. Affluence of a neighbourhood would be a draw if you are considering burglary but if this goes with high security then it may be a deterrent. In this case the mid-level socio-economic areas may be more attractive.
2. Scale is another issue. Some of the work on definitions of exposure looked at different distance bands and the geography of crime. Scale of exposure may vary for different kinds of crime and we may need a more localised definition of exposure. There is some research on spatial measures of clustering which shows how the relationship can break down with clustering.
3. It is good that the Safe Cities initiative includes a qualitative slant. We should pull this information in to explain the notions of exposure at the individual level.

Robert van Niekerk, ISER, Rhodes University.
I think we must identify that these kinds of discussions are still embryonic; we are still working through the research agenda, but have a fantastic starting point here. This is going to lead to greater questions which will help us decide how to shape the 'good society' from this policy work and what are the interventions that will ensure that inequality is reduced. This has been an exciting set of discussions which hopefully we will build on in the future.

MAIN CONCLUSIONS AND RECOMMENDATIONS

Mapping Poverty and Inequality

- Mapping poverty using the South African Index of Multiple Deprivation clearly highlights former homeland areas as areas with the highest poverty levels.
- Inequality and poverty do not have a simple relationship with each other and areas such as the former Transkei are characterised by low inequality but high poverty.
- Low inequality is not necessarily a sign of success and nor is rising inequality necessarily bad because it can occur as rich and poor become more integrated.
- Several speakers emphasised the need to complement the quantitative information with qualitative research and more sophisticated methods to properly explain the 'lived experience' of inequality.
- Exposure indices can measure the degree of likely interaction between different population sub-groups and the degree to which the poor are exposed to the non-poor and the non-poor are exposed to the poor. This 'Exposure Factor' can help describe the 'lived experience' of inequality.
- Comparisons of UK and USA data for common demographic, social and economic variables found broadly similar geographies suggesting that the methodology is robust enough to be worth pursuing.
- Comparisons of UK and South African multiple deprivation data showed some North/South differentiation for England and Wales but this is not as marked as the contrast between say the Eastern and Western Cape in South Africa.
- International comparative studies provide a means of assessing common or contrasting experiences of geographic inequalities and the ways in which they are changing.
- A better understanding of the spatial distribution of inequalities, as well as the magnitude of inequalities, is important because scale is crucial to understanding geographic inequalities and how these may be addressed.
- The composite $ExposFac_{xy}$ measure of exposure to inequality, which uses all the domains of deprivation (Income, Employment, Education and Living Environment), shows that inequality exposure is highest in Tshwane and Cape Town, but that there is far more variation within Tshwane than within Cape Town.

- Social grants have a marked impact on poverty if the poverty line is set low enough. However, while they go some way to reducing poverty they do less to change inequality which requires addressing unemployment, with permanent jobs, and raising incomes.

Recommendations for further research

- The exposure results can be analysed at a detailed geographical level to explore variations within municipalities.
- Research has also begun to look at neighbourhoods with many poor people experiencing extreme inequality exposure on a daily basis. It could be argued that places exposed to the twin stresses of very high poverty and very high exposure may be predisposed to social unrest and violent crime; this is to be the subject of further analysis.
- The *ESRC Pathfinder Inequality Project* demonstrated that exposure to inequality has some effect on people's attitudes to inequality and options for redress. But limitations in the data meant that the effects were only observable through the interaction of exposure with other explanatory variables. It was recommended that additional questions are included in future surveys, such as SASAS, to provide greater discriminatory power between response categories.
- The study demonstrated the value of combining different types of data to produce new insights about the intersection of inequality, space and social beliefs. Further experimentation of this type is recommended to produce policy-relevant evidence on the interplay between spatial inequality and citizen attitudes, as well as other aspects of social life and its dynamics.
- There is no agreed definition or index of 'social cohesion' and there is a need for further work on this. The *UCT Poverty & Inequality Initiative* has begun this work and further discussion of the topic with other researchers was recommended.
- Small area data on crime is necessary to look at the relationships between crime and potential crime-generating factors. This calls for access to crime statistics at a finer resolution than the currently available police station level, i.e. at docket level. The information would be of strategic value for research and policy direction and with appropriate controls has been made available in other countries such as the UK.

APPENDIX 1: PROGRAMME

Rapporteur: *Prof. John Seager, Freelancer*

Chair: Dr Gemma Wright, Research Director, Southern African Social Policy Research Institute (SASPRI)

08:00 - 09:00	Registration, Tea & Coffee
09:00 - 09:10	Introduction
09:00-09:10	***Welcome and Introductions*** Dr Temba Masilela, HSRC and Prof Robert van Niekerk Rhodes University
09:10 – 10:30	Session 1
09:10 - 09:30	***Setting the Scene – the spatial patterning of poverty and multiple deprivation in South Africa*** Prof. Michael Noble, Executive Director of SASPRI, Honorary Research Fellow HSRC, Visiting Professor Rhodes University Dr Wanga Zembe Director and Research Fellow SASPRI
9.30 – 10.10	***Measuring Spatial Inequality – An international perspective*** Dr. Chis Lloyd, Department of Geography and Planning University of Liverpool UK
10.10 -10.30	***Q&A***
10:30 -10:50	Tea break
10:50 – 12:30	Session 2
10:50 – 11:20	***Developing a new spatial measure of exposure to socio-economic inequality in South Africa*** Mr David McLennan, CASASP, University of Oxford
11:20 – 11:40	***Q&A***
11:40 – 12:10	***The Results: how does a person's exposure to socio-economic inequality vary spatially according to where they live?*** Mr David McLennan, CASASP, University of Oxford
12:10 – 12:30	***Q&A***
12:30 – 13:30	LUNCH

13:30 – 14:30	Session 3
13:30 – 14:10	***Are people's attitudes towards inequality and options for redress influenced by their exposure to inequality?*** *Mr Ben Roberts, HSRC & Mr David McLennan, CASASP.*
14:10 – 14:30	***Q&A***
14:30 – 16:00	Session 4
14:30 – 15:50	***Are neighbourhood crime rates influenced by residents' exposure to inequality?*** **A brief presentation followed by a panel discussion** **Panel: Chris Lloyd; Hangwelani Hope Magidimisha; David McLennan; Ben Roberts; Robert van Niekerk** *Panel and Audience discussion on the way forward*
15:50 – 16:00	Closure
15:50 – 16:00	Dr Gemma Wright, Research Director, Southern African Social Policy Research Institute (SASPRI)
	oo000 – Departure – 000oo

APPENDIX 2: BIOSKETCHES

Dr Chris Lloyd is a Senior Lecturer in Human Geography. His research focus is on spatial data analysis, and in particular on local spatial statistics and the exploration of spatial scale. He has a particular interest in the conceptualisation and measurement of residential segregation, and in the analysis of spatial inequalities more generally.

Mr David McLennan is a Senior Research Fellow at the Centre for the Analysis of South African Social Policy (CASASP), University of Oxford. His primary research interest is in the spatial distribution of poverty and deprivation at small area level within South Africa and the UK. He has extensive experience of working with large national individual-level administrative and Census datasets.

Ms Hangwelani Hope Magidimisha is a registered professional planner who is based in the HSRC's Democracy, Governance and Service Delivery research programme. She has recently submitted her doctoral thesis in Town and Regional Planning at the University of KwaZulu-Natal on the topic of spatial inequality in service delivery in Vhembe District Municipality, Limpopo. She was also part of the *ESRC Pathfinder project* that was recently completed by Oxford University and the HSRC on spatial inequality and attitudes to inequality in contemporary South Africa.

Dr Temba Masilela is the Deputy CEO of Research at the Human Science Research Council (HSRC), South Africa. His wide-ranging research interests include social policy, public management reform, social innovation, research communication, the research-policy nexus, and stakeholder engagement. He was the founding director of the Policy Analysis Unit at the HSRC and was previously the executive director of the Policy Analysis and Capacity Enhancement cross-cutting programme at the HSRC.

Prof Michael Noble is Executive Director of the Southern African Social Policy Research Institute (SASPRI), a visiting professor at Rhodes University and an Honorary Fellow at the Human Sciences Research Council. He is also Emeritus Professor of Social Policy at the University of Oxford in the UK. His main research interests are in poverty, deprivation, inequality and income maintenance policy particularly in sub-Saharan Africa. He specialises in quantitative research methods and is committed to evidence-informed policy making.

Mr Ben Roberts is a research specialist in the Democracy, Governance and Service Delivery unit at the HSRC. He has a BSc in town and regional planning (*cum laude*) from the University of the Witwatersrand and an MSc in urban and regional planning (development) (*cum laude*) from the University of Natal. Before joining the HSRC, he was research fellow in the Population and Poverty Studies Programme at the School of Development Studies at the University of Natal. His areas of research interest include the analysis of poverty and inequality dynamics, sustainable livelihood development, poverty reduction strategy papers (PRSPs), and monitoring progress towards the Millennium Development Goals (MDGs). More recently, he has conducted poverty and inequality analysis for Namibia's MDGR, run training on national poverty line specification in Zimbabwe, and participated in a scoping exercise to help inform the design of DFID's envisaged regional hunger and vulnerability programme for Southern Africa.

Prof John Seager is a freelance research consultant with over 30 years public health research experience in Africa. His research has covered AIDS and development, tuberculosis, diabetes care, urban health systems, and social determinants of health. He obtained a PhD in Ecology and Population Dynamics at the University of Wales and holds positions as an extraordinary professor at the University of the Western Cape and the University of Stellenbosch. His main research interest is social determinants of health among the poor in developing countries. Recent work includes health systems evaluation, HIV and AIDS, homeless populations and social aspects of climate change. His publication record spans the authoring and co-authoring of more than 60 journal articles, 50 research reports and 100 presentations at scientific meetings.

Prof Robert van Niekerk is the Director of the Institute of Social and Economic Research and associate professor of Social Policy at Rhodes University. His research, teaching and publications cover the institutional history, ideologies and understandings of social policy and social change in South Africa. Prof van Niekerk is currently the project lead researcher (or co-leader) on several research projects, including a multi-country large-scale study on the developmental state and social policy; a research programme on health policy and private medical practitioners; and a research study on the social policy positions of political parties and the views of social citizenship and the post-apartheid good society that those social policy positions reflect.

Dr Gemma Wright is SASPRI's Research Director. She is also a Professor Extraordinarius at the Archie Mafeje Research Institute at the University of South Africa (UNISA), a Research Associate at Rhodes University, and a Research Fellow at the Centre for International Education at the University of Sussex in the UK. Her research interests include poverty, child poverty, and social security policy.

Dr Wanga Zembe is a Director and Research Fellow of SASPRI. She is also a Senior Scientist at the Medical Research Council and has research experience in child poverty and child health. Her main interests are research and teaching in social policy, specifically as these relate to poverty and inequality.

APPENDIX 3: ATTENDANCE

No.	Title	Name	Surname	Position/Department	Organisation	Telephone/Cell	E-mail address
1	Ms	Wafaa	Abdurahman		Action Forum for Palestine	0763182714	Wafaa.abdurahman@yahoo.com
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4	Ms	Zulfah	Albertyn	School of public health and family medicine	UCT	0833764985	z.albertyn14@gmail.com
5	Mr	Julius	Benn	Population Analyst	Department of Social Development Western Cape	021 483 5678	Julius.Benn@westerncape.gov.za
6		Kim	Bloch		UCT	081 835 9970	kimlbloch@gmail.com
7	Dr	Jacqueline	Borel-Saladin	Post-doctoral research fellow	HSRC		jborel-saladin@hsrc.ac.za
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9	Ms	Chris	Byrchrouz		UCT	0718758779	byrchrouz@myuct.ac.za
10	Dr	Derek	Davids		HSRC		ydavids@hsrc.ac.za
11	Prof.	Andries	Du Toit	Professor	Institute for Poverty, Land and Agrarian Studies, UWC		adutoit@plaas.org.za
12	Mr	Thiyane	Duda	Centre for Law and Society	UCT		
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19	Ms	Zuzi	Khuzwayo		HSRC		zkhuzwayo@hsrc.ac.za
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22	Ms	Alize	Le Roux	Senior Geoinformatics researcher	CSIR	084 514 1966	ALeroux1@csir.co.za
23	Mr	Sam	Lloyd	Research Co-ordinator	UCT	0718 271 956	sjn.lloyd1@googlemail.com
24	Dr	Chris	Lloyd	Dept of Geography and Planning	University of Liverpool UK		C.D.Lloyd@liverpool.ac.uk
25	Mr	Joseph	Lukhwareni		StatsSA	0824442486	JosephL@statssa.gov.za
26	Ms	Randy	Magampa				mmagampa@hsrc.ac.za
27		Hangwelani Hope	Magidimisha		HSRC	021 466 7833	hmagidimisha@hsrc.ac.za
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APPENDIX 4: PRESENTATIONS

saspri
Southern African Social Policy Research Institute
Southern African Social Policy Research Insights

Setting the Scene – the spatial patterning of poverty and multiple deprivation in South Africa

Michael Noble
Wanga Zembe

Poverty or Inequality?

- Persistent inequality, rather than poverty *per se,* is increasingly regarded as a major correlate of various social problems
- But inequality usually expressed at high levels of spatial aggregation and says little about an individuals 'lived experience' of inequality
- Focus of the day will be to look at ways of measuring spatial variations in inequality drawing on the rich international literature of spatial segregation
- As context, the nature of spatial patterning of poverty in South Africa in 2011 will be described and the relationship between poverty and inequality at small area level examined

Outline

- Background
- Creating small area income poverty measures for 2011.
- Spatial patterning of income poverty
- Measuring inequality at small area level
- Relationship between poverty and inequality

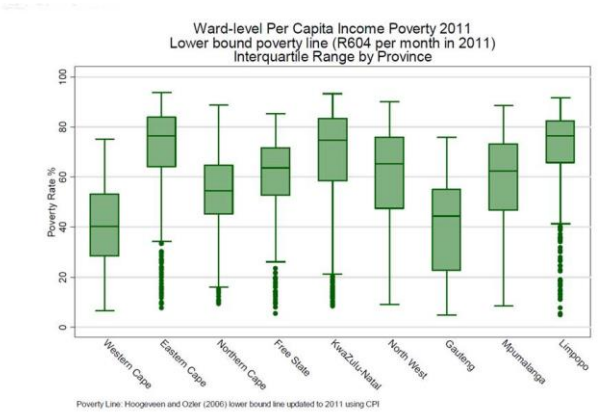
Income poverty at ward level

Spatial Patterning of Poverty

- Poverty and deprivation are invariably spatially differentiated
- SA colonial, segregation and apartheid legacy
  - 1913 Land Act,
  - Natives (Urban Areas) Act of 1923
  - Group Areas Acts 1950 – 1966
  - Bantu Authorities Act 1951
- South African Indices of Multiple Deprivation (2001 – 2011) have consistently shown the persistence of spatial differentiation in terms of social and economic segregation into the democratic era

Income Poverty at small area level in 2011

- Hoogeveen and Özler (2006).
- "lower bound" poverty line = R604 and an "upper bound" poverty line = R1113 pcpm in 2011
- Uses published (Superstar) ward level tables using household income and household size



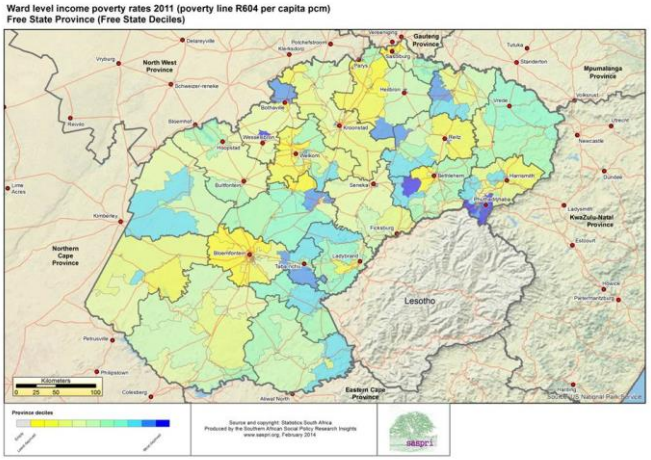
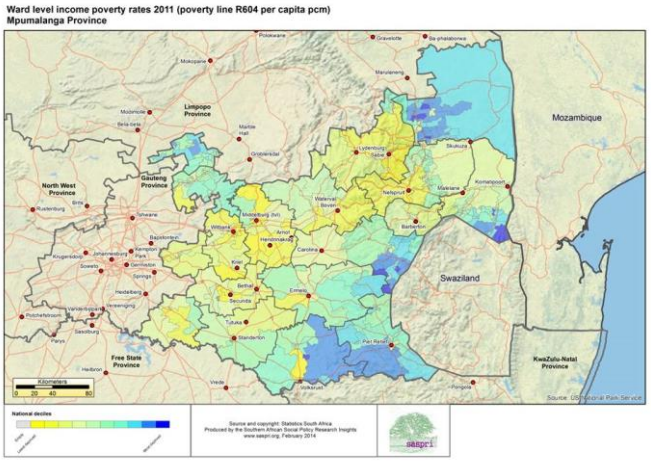


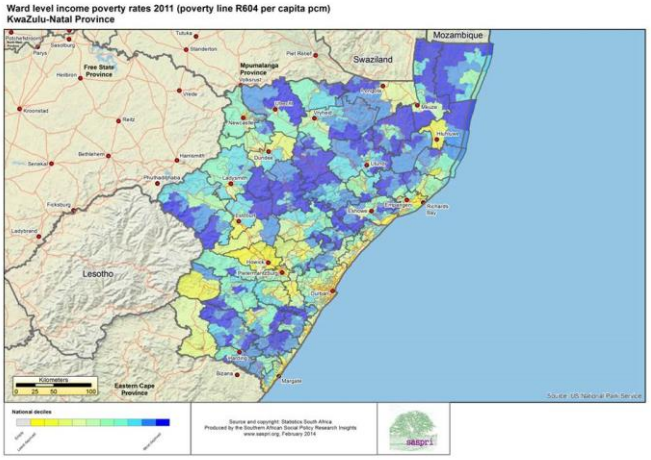
Table 2: The 10 district municipalities/Metros with the highest lower bound poverty rates in 2011

Province	District Code	District Name	% of population below Lower Bound Poverty Line	Rank (Where 1=area with highest lower bound poverty rates and 52 = area with lowest lower bound poverty rates)
Eastern Cape	DC44	Alfred Nzo	81.6	1
Eastern Cape	DC15	O.R.Tambo	80.5	2
KwaZulu-Natal	DC27	Umkhanyakude	80.1	3
KwaZulu-Natal	DC24	Umzinyathi	78.7	4
KwaZulu-Natal	DC26	Zululand	77.6	5
KwaZulu-Natal	DC43	Sisonke	76.3	6
Eastern Cape	DC12	Amathole	75.6	7
Limpopo	DC47	Greater Sekhukhune	74.7	8
KwaZulu-Natal	DC23	Uthukela	74.0	9
Eastern Cape	DC14	Joe Gqabi	73.4	10

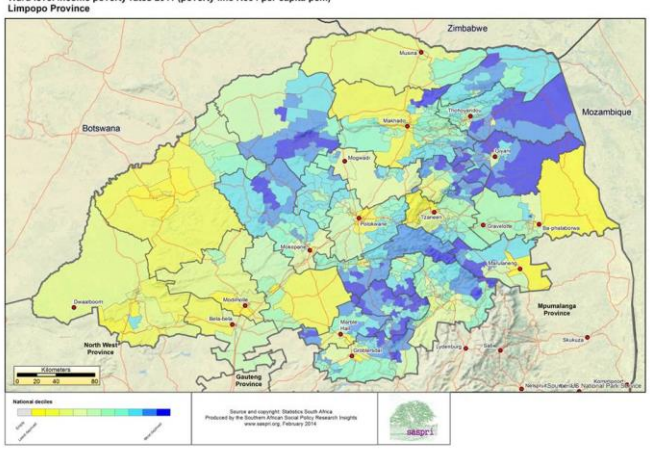


20 Poorest Local Municipalities

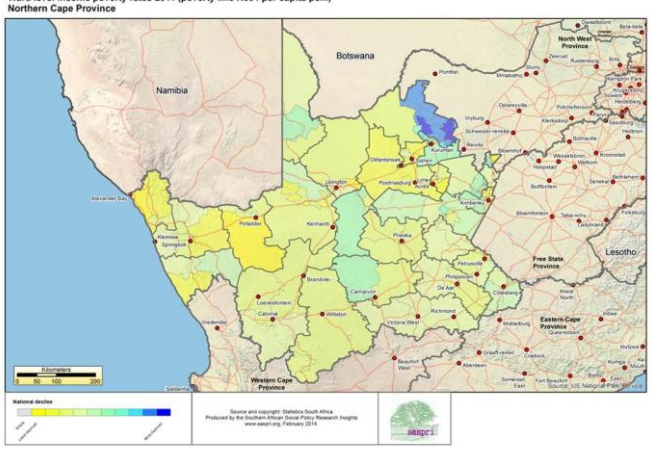
Province	Local Municipality Code	Local Municipality Name	% of population below Lower Bound Poverty Line	Rank (Where 1=area with highest lower bound poverty rates and 226 = area with lowest lower bound poverty rates)
Eastern Cape	291	Port St Johns	86.7	1
Eastern Cape	298	Ntabankulu	86.3	2
KwaZulu-Natal	569	Indaka	86.2	3
KwaZulu-Natal	576	Msinga	85.5	4
KwaZulu-Natal	575	Nquthu	84.7	5
Eastern Cape	290	Ngquza Hill	84.3	6
Eastern Cape	297	Mbizana	84.2	7
Eastern Cape	292	Nyandeni	84.2	8
KwaZulu-Natal	582	Umhlabuyalingana	82.9	9
North West	665	Ratlou	82.6	10
KwaZulu-Natal	580	Nongoma	82.4	11
KwaZulu-Natal	583	Jozini	82.3	12
Eastern Cape	284	Engcobo	82.3	13
KwaZulu-Natal	546	Maphumulo	82.1	14
KwaZulu-Natal	588	Ntambanana	81.9	15
KwaZulu-Natal	598	Umzimkhulu	81.7	16
Eastern Cape	293	Mhlontlo	81.7	17
Eastern Cape	270	Mbhashe	81.5	18
Limpopo	985	Makhuduthamaga	81.5	19
KwaZulu-Natal	542	Nkandla	81.4	20



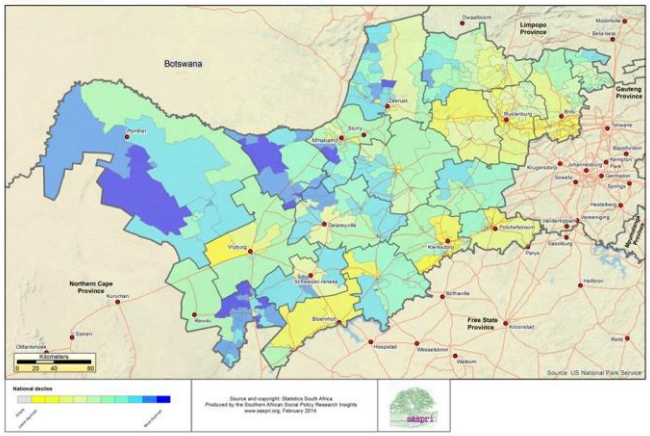
Ward level income poverty rates 2011 (poverty line R604 per capita pcm)
Limpopo Province



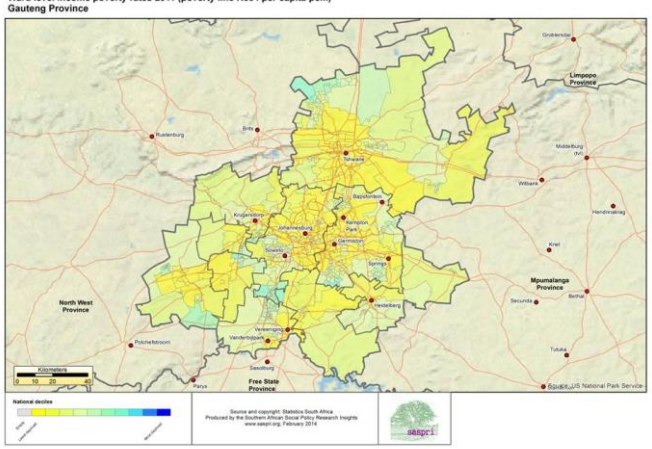
Ward level income poverty rates 2011 (poverty line R604 per capita pcm)
Northern Cape Province



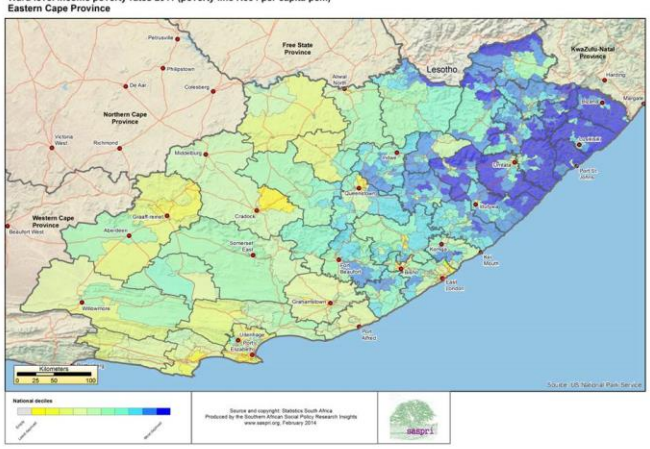
Ward level income poverty rates 2011 (poverty line R604 per capita pcm)
North West Province



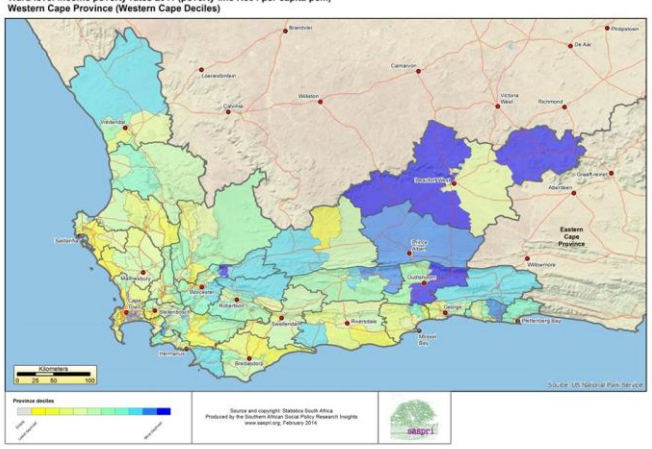
Ward level income poverty rates 2011 (poverty line R604 per capita pcm)
Gauteng Province



Ward level income poverty rates 2011 (poverty line R604 per capita pcm)
Eastern Cape Province

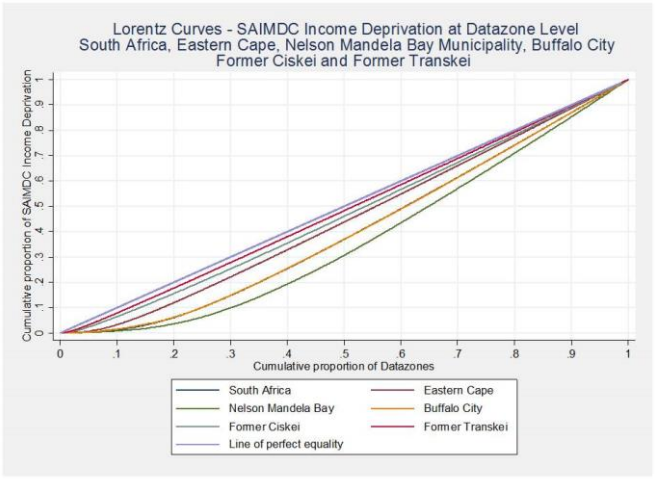


Ward level income poverty rates 2011 (poverty line R604 per capita pcm)
Western Cape Province (Western Cape Deciles)



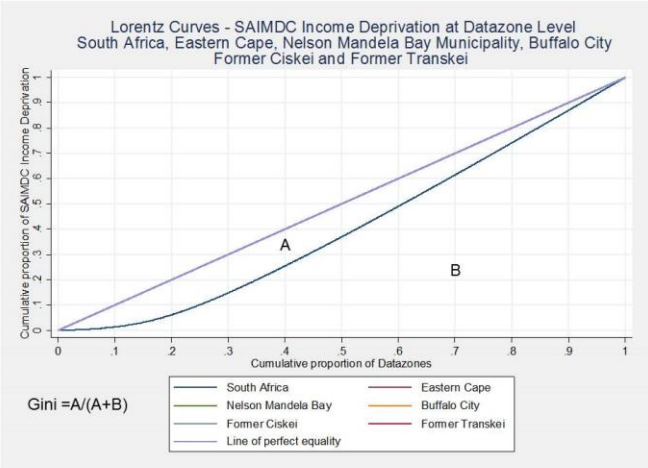
Poverty in Former Homelands

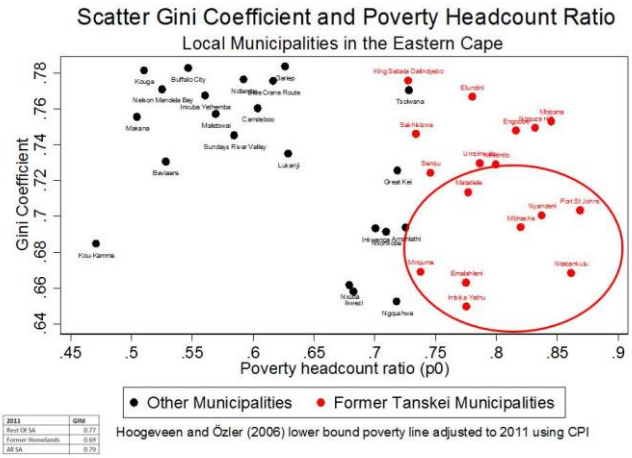
Area	Lower Bound (R604) %	Upper bound (R1113) %
Former Bophuthatswana	63.1	72.7
Former Ciskei	68.0	77.2
Former Gazankulu	77.0	84.2
Former KaNgwane	71.4	80.9
Former KwaNdebele	66.7	78.5
Former KwaZulu	73.6	82.3
Former Lebowa	74.5	82.7
Former Qwa Qwa	74.9	83.4
Former Transkei	80.3	86.6
Former Venda	75.1	82.9
All of former homelands	73.4	81.7
Rest of South Africa	46.0	55.3
South Africa	55.7	64.6

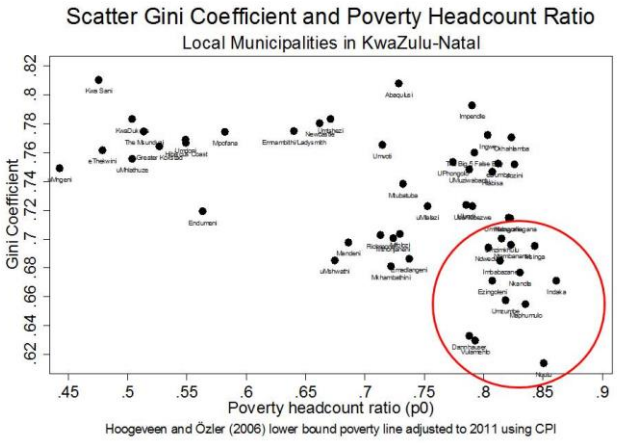


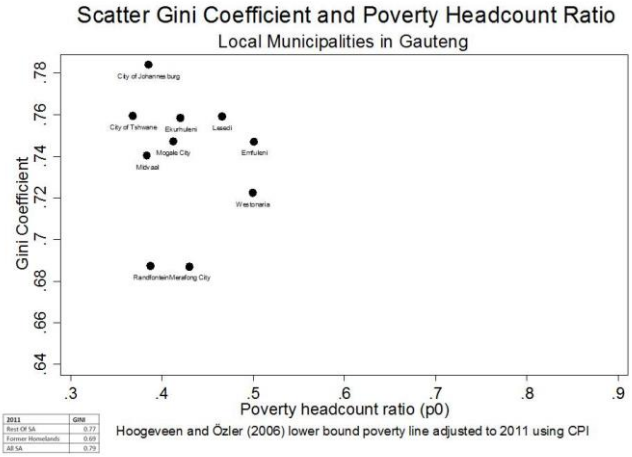
Measuring inequality using Lorentz curves/gini coefficients – examples from the Eastern Cape

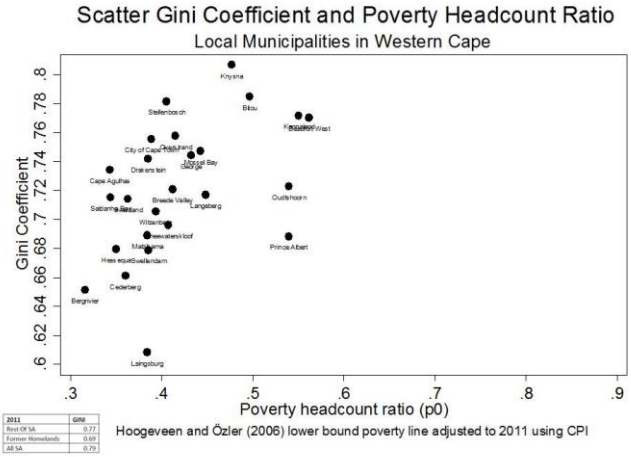
Comparing Income Poverty and Inequality at Local Municipality/Metro Level











Concluding Remarks

- Income Poverty is highly spatially differentiated and still reflects the historical legacies of colonialism segregation and apartheid
- Highest poverty levels are in the former homelands
- Inequality and poverty do not have a simple relationship with each other
- More sophisticated accounts are necessary to reflect the lived experience of inequality

Measuring Spatial Inequality
An International Perspective

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Human and Social Dynamics (HSD) Research Seminar Series, 3rd March 2015

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Spatial structure and inequalities

- Are inequalities the same across areas?
- How far are population sub-groups geographically:
  - Uneven?
  - Clustered?
- What are the scales of geographical inequalities?
  - Locally clustered?
  - Strong regional trends?

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Outline

1. Defining spatial structure and spatial inequalities
2. Measuring spatial inequalities in England and Wales analysis: 2001 and 2011
3. Comparative research
   1. England and Wales and the USA
   2. South Africa and England

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Spatial structure and inequalities

- Example of Northern Ireland
  - The population is more spatially concentrated by religion than by a host of demographic, social and economic variables
  - But, religious segregation reduced between 1971 and 2011

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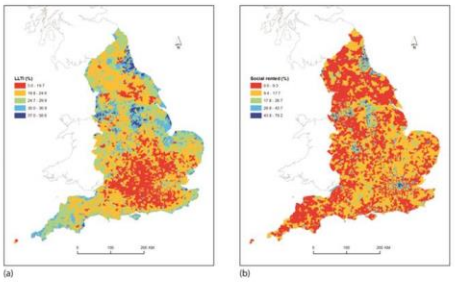
Spatial structure: Health (LLTI) and social rented households in 2001, in England by Census wards



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Measures of population distribution

Index of dissimilarity, *D*
Measure of spread of two groups possible values 0-1

0 = the groups are equally spread (e.g., all zones have a 65/35 split of two groups)

1 = the groups are completely uneven (all zones are 100% one group and 0% of the other)

Moran's *I* (autocorrelation coefficient)
A measure of the correlation between data values and neighbouring data values (thus, a measure of clustering)

Unlike correlation coefficient, not strictly constrained to -1, 1

Positive values = clustering; negative values = neighbouring values tend to be different

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Measures of population distribution

Variogram: spatial dependence at different spatial scales

1. Take each data value in turn and compute its squared difference from each of the other values in the data set and store the distances between them
2. Group these differences into distance bins – e.g., all squared differences for pairs separated by 1 to 2 km and compute half of the average of these differences
3. Plot these (half) average differences against distances
4. The plot shows how difference between values changes as a function of distance

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Spatial Scale and Geographical Inequalities in England and Wales, 2001-2011

Common demographic, social and economic variables derived from the England and Wales Census for 2001 and 2011

Age, Ethnicity, Housing tenure, Car or van access, Qualifications, Employment, National Statistics Socio-economic classification and Health.

How uneven are population sub-groups in England and Wales?

How clustered are these groups and over what spatial scales are they concentrated?

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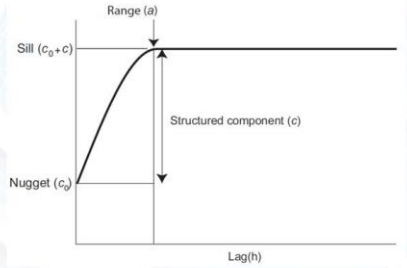
Variogram model



Bounded variogram model: nugget and effect and spherical component.

Provides a composite measure of clustering and polarisation: small nugget indicates localised clustering – with a large sill this indicates polarisation

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Variables

Variable	Description
A0to15	Persons aged 0 to 15 years
A16to29	Persons aged 16 to 29 years
A30to64	Persons aged 30 to 64 years
A65plus	Persons 65 years plus
WhiteNW	(Non) White persons
OwnOcc	Owner occupied households
SocRent	Social rented households
PrivRent	Private rented households
NoCarsVans	Households with (no) cars or vans
NoQualQual	Persons with (no) qualifications
EAEmployUnemp	(Un)employed persons
NSSEC12	Persons in NSSEC 1-2
NSSEC37	Persons in NSSEC 3-7
NSSEC8	Persons in NSSEC 8
LLTI	Persons with (no) LLTI

Data are of 2001 and 2011 Output Areas for England and Wales

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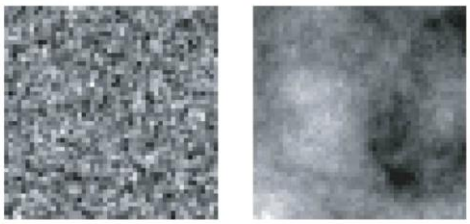
Variograms



Simulated surfaces: spherical model with a = 2 and 40.

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Variables: log-ratios

Number of parts
2: Ethnicity (White/NonWhite), CarsVans (NoCars/Cars), Qual (Non qual/qual), Employ (employ/unemployEA), LLTI (LLTI/non LLTI)
3: Tenure (OwnOcc/PrivRent/SocialRent), NSSEC (NSSEC1and2/3to7/8)
4: Age (A0to15/A16to29/A30to64/A65plus)

Tenure (**Denominator**)

x_1	x_2	x_3
OwnOcc	PrivRent	**SocRent**
OwnOcc	**PrivRent**	

NSSEC

x_1	x_2	x_3
NSSEC12	NSSEC37	**NSSEC8**
NSSEC12	**NSSEC37**	

Age

x_1	x_2	x_3	x_4
A0to15	A16to29	A30to64	**A65plus**
A0to15	A16to29	**A30to64**	
A0to15	**A16to29**		

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Index of dissimilarity, *D*

Variable	2001	2011	2011-2001
A0to15	0.159	0.161	0.002
A16to29	0.197	0.208	0.011
A30to64	0.110	0.102	-0.008
A65plus	0.258	0.274	0.016
WhiteNW	0.623	0.592	-0.031
OwnOcc	0.491	0.446	-0.045
SocRent	0.613	0.592	-0.021
PrivRent	0.384	0.371	-0.013
NoCarsVans	0.391	0.402	0.011
NoQualQual	0.223	0.255	0.032
EAEmployUnemp	0.329	0.300	-0.029
NSSEC12	0.271	0.265	-0.006
NSSEC37	0.239	0.207	-0.032
NSSEC8	0.464	0.374	-0.090
LLTI	0.197	0.199	0.002

Data: Output Areas for England and Wales

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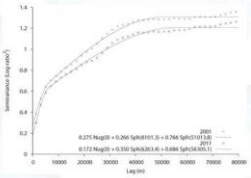
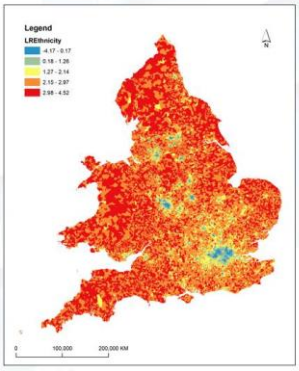
White/Non White





2011 OAs

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Moran's *I*

	LA 20 NN 2001	LA 100 NN 2001	LA 20 NN 2011	LA 100 NN 2011	LA 20 NN 2011-2001	LA 100 NN 2011-2001
LRage1	0.345	0.216	0.448	0.321	0.103	0.105
LRage2	0.395	0.278	0.440	0.321	0.045	0.043
LRage3	0.431	0.335	0.524	0.417	0.093	0.082
LREthnicity	0.752	0.702	0.838	0.774	0.086	0.072
LRTenure1	0.388	0.255	0.400	0.248	0.012	-0.007
LRTenure2	0.475	0.360	0.577	0.455	0.102	0.095
LRCarsVans	0.584	0.448	0.645	0.515	0.061	0.067
LRQual	0.598	0.468	0.564	0.437	-0.034	-0.031
LREmploy	0.445	0.359	0.475	0.367	0.030	0.008
LRNSSEC1	0.481	0.387	0.591	0.473	0.110	0.086
LRNSSEC2	0.664	0.530	0.697	0.561	0.033	0.031
LLTI	0.397	0.297	0.411	0.307	0.014	0.01

Data: Output Areas for England and Wales
NN is nearest neighbours

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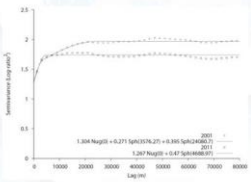
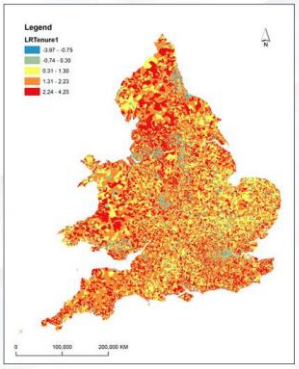
Owner occupied HH and Private rented / Social rented HH





2011 OAs

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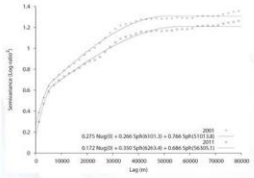
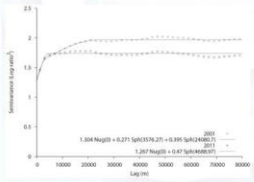
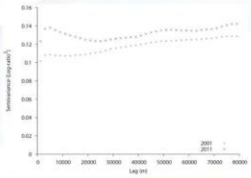
Variograms



White/non White: Clustering over small areas increased between 2001 and 2011, variance decreased – strong spatial structure, but regions are becoming more similar (consistent with standard deviation)



Owner occupied and Private rented HH / Social rented HH: Clustering over small areas increased between 2001 and 2011, but variance decreased; much less spatial structure than for White/non White



LLTI: Clustering over small areas, but no evidence of spatial structure; variance increased – regions are becoming more dissimilar

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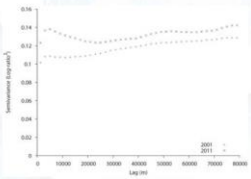
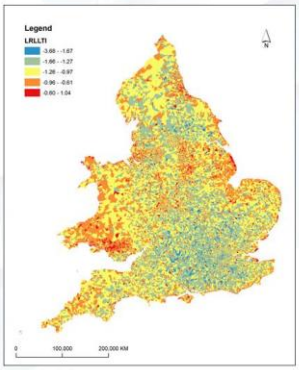
LLTI/Non LLTI





2011 OAs

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Findings summary

Rank	*I*: 2001	*I*: 2011	SD: 2001	SD: 2011
1	LREthnicity	LREthnicity	LRTenure1	LRTenure1
2	LRNSSEC2	LRNSSEC2	LREthnicity	LREthnicity
3	LRQual	LRCarsVans	LRNSSEC1	LRCarsVans
4	LRCarsVans	LRNSSEC1	LRTenure2	LRNSSEC1
5	LRNSSEC1	LRTenure2	LRCarsVans	LRTenure2
6	LRTenure2	LRQual	LRage1	LRage1
7	LREmploy	LRage3	LREmploy	LREmploy
8	LRage3	LREmploy	LRNSSEC2	LRQual
9	LRLLTI	LRage1	LRQual	LRNSSEC2
10	LRage2	LRage2	LRage3	LRage3
11	LRTenure1	LRLLTI	LRLLTI	LRLLTI
12	LRage1	LRTenure1	LRage2	LRage2

Log-ratios ranked from largest (Rank 1) to smallest (12) for values of Moran's *I* (20 nearest neighbours) and standard deviation (SD)

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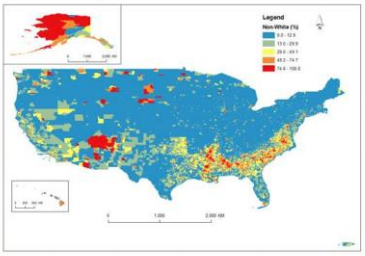
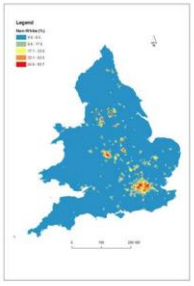


USA: percentage of non-White persons by Census tract, 2012 ACS.



England and Wales: percentage of non-White persons by ward, 2011 Census.

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Findings

- The age variables tend to be **less uneven** and **less clustered** than the other variables
- Small levels of clustering reflect, in some cases, high levels of clustering in some areas, but high variability elsewhere – social housing is a key example
- Between 2001 and 2011 **unevenness** in most population sub groups in England and Wales **reduced**
- Over the same period, there was an **increase in localised clustering** in the population by most of the demographic and socioeconomic variables assessed
- Taken together, the findings suggest that **local areas have become more similar** but, for many variables, this is against a background of **reduced regional variation**
- In simple terms, there is **increased clustering *within* regions** but **decreased difference *between* regions** for many population variables

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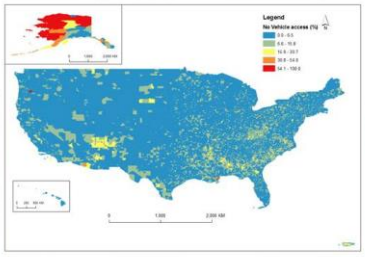
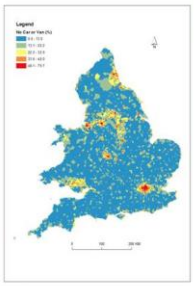


USA: percentage of households with no vehicle access by Census tract, 2012 ACS.



England and Wales: percentage of households with no car or van by ward, 2011 Census.

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England and Wales and USA comparison: unevenness

Common demographic, social and economic variables derived from the England and Wales Census for 2011 and the 2012 American Community Survey:

Age, Ethnicity, Housing tenure, Vehicle use, Qualifications, Employment and Health.

Given broadly comparable variables and zonal systems, how uneven are population sub-groups in England and Wales and in the USA?

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	USA Tracts	E&W LSOAs	E&W Wards
N zones	74,001	34,753	8,546
Mean pop	4,228	1,614	6,562
Variable (vs rest)	***D***		
A0to17	0.138	0.117	0.087
A18to29	0.197	0.202	0.180
A30to64	0.097	0.075	0.058
A65plus	0.214	0.209	0.169
White	0.493	0.576	0.561
OwnOcc	0.393	0.370	0.289
NoVehicle	0.455	0.357	0.308
NoQual	0.287	0.212	0.178
UnEmployed	0.233	0.252	0.212
Health	0.201	0.150	0.122

D for USA tracts and England and Wales (E&W) lower super output areas and wards.

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	USA Tracts	E&W LSOAs	E&W Wards
Variable (vs rest)	***D***		
A0to17	0.055	0.026	0.027
A18to29	0.058	0.066	0.078
A30to64	0.028	0.021	0.019
A65plus	0.065	0.110	0.113
White	0.248	0.318	0.367
OwnOcc	0.248	0.167	0.177
NoVehicle	0.467	0.184	0.207
NoQual	0.122	0.129	0.125
UnEmployed	0.081	0.071	0.083
Health	0.082	0.096	0.099

Spatial *D* (1km Gaussian bandwidth) for USA tracts and England and Wales (E&W) lower super output areas and wards.

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IMD scores: Moran's *I* statistic (clustering)

England MSOAs: 32482
South Africa Data Zones: 22846

Moran's *I*	10	50	100	500	1000	2500
England	0.640	0.49	0.417	0.266	0.216	0.152
South Africa	0.711	0.635	0.594	0.495	0.456	0.394

Percentage of zones						
Percentage	*0.25*	*0.5*	*1*	*2*	*5*	*10*
England n	*81*	*162*	*325*	*650*	*1624*	*3248*
South Africa n	*57*	*114*	*228*	*457*	*1142*	*2285*

Moran's *I*	0.25	0.5	1	2	5	10
England	0.439	0.365	0.299	0.247	0.182	0.135
South Africa	0.627	0.586	0.544	0.500	0.449	0.402

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South Africa and England comparison: clustering and spatial scale

Index of multiple deprivation for South Africa (data zones; *n* = 22846; for 2001) and England (middle super output areas ; *n* = 32482; for 2010)

How clustered is the IMD in South Africa and in England?

What are the dominant spatial scales of inequality in South Africa and in England?

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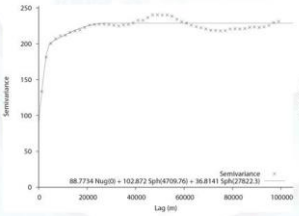
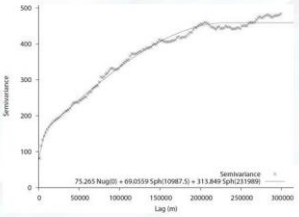
IMD scores



England



South Africa

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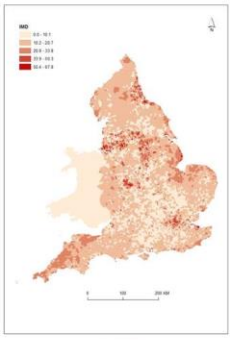
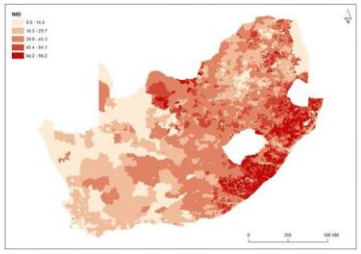
IMD scores



2010



2001

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Summary

International comparative studies provide a means of assessing common or contrasting experiences of geographic inequalities and the ways in which they are changing.

An understanding of the spatial distribution of inequalities, as well as the magnitude of inequalities, is important.

Scale is crucial to an understanding of geographic inequalities.

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Acknowledgements

The Office for National Statistics are thanked for provision of the England and Wales data for 2001 and 2011.

Office for National Statistics, 2001 Census: Digitised Boundary Data (England and Wales) [computer file]. ESRC/JISC Census Programme, Census Geography Data Unit (UKBORDERS), EDINA (University of Edinburgh)/Census Dissemination Unit. Census output is Crown copyright and is reproduced with the permission of the Controller of HMSO and the Queen's Printer for Scotland.

Michael Noble is thanked for the provision of the South Africa IMD data.

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Spatial measures of socio-economic inequality in South Africa

Spatial exposure to inequality: Methods

David McLennan, University of Oxford
Michael Noble, Southern African Social Policy Research Institute
Benjamin J. Roberts, Human Sciences Research Council

Background and rationale

- The South African government now lists inequality alongside poverty and unemployment as the three core economic challenges facing the country.
- Both the New Growth Path (NPG 2010) and the National Development Plan (NDP 2012) adopt inequality reduction as a core priority.
- International (but largely northern hemisphere) evidence that inequality may be an important driver of social problems such as violent crime and social unrest.
- Strong imperative to broaden and deepen the empirical evidence base concerning inequality in South Africa.

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Two research projects

'***Exploring the relationships between spatial inequality and attitudes to inequality in South Africa***' (UK ESRC & SA NRF funded):

1. Analyse the unequal spatial configuration of deprivation at small area level as a measure of people's lived experience of inequality.
2. Analyse people's attitudes towards inequality and towards policy options for redress.
3. Test whether people's attitudes are influenced by (or associated with) their lived experience of inequality.

'***Social cohesion: the missing link in overcoming violence, inequality and poverty***' **in South Africa and Brazil** (Canadian IDRC & UK DfID):

1. Analyse spatial patterns and trends in violent crime and potential explanatory factors – including inequality – at relevant spatial levels.
2. Explore relationships between these factors, including examining the role of social cohesion, drawing upon both quantitative and qualitative work.

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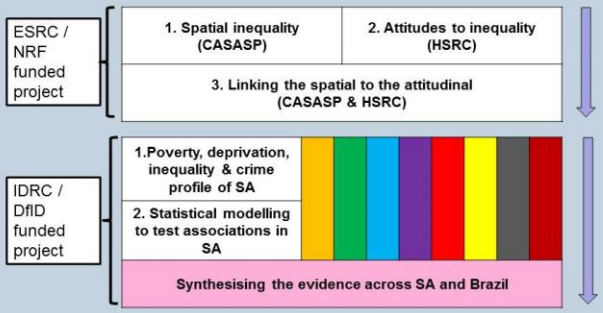
Spatial Inequality

Why measure spatial inequality?

- Much of the existing quantitative research concerning inequality in South Africa utilises the 'classical' measures of (income) inequality such as the Gini coefficient, General Entropy measures, or the Atkinson index, and is expressed at high spatial levels (e.g. national or provincial).
- These measures say little about people's 'lived experience of inequality' and how this varies *geographically* within a country.
- We argue that people's experience of inequality is contoured by the geographical settings in which they live, work and travel.
- Requires a neighbourhood-level approach.

Structure of the two projects

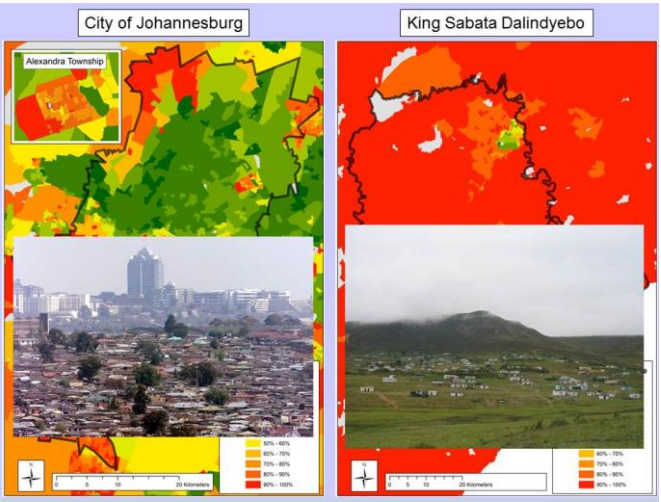


Spatial inequality: residential segregation

- Residential segregation indices measure the degree to which two (or more) population sub-groups live separately from one another, at small area (i.e. neighbourhood) level. Utilise categorical data.
- We applied and developed a range of these indices to measure segregation between the 'poor' population and the 'non-poor' population (i.e. dichotomous classification) across the whole of South Africa.
- Our aim was to develop a measure of residential segregation that reflects people's lived experience of inequality in South Africa.
- Required a dataset that counts the number of 'poor' people and the number of 'non-poor' people for each neighbourhood across the whole of South Africa.

South African Index of Multiple Deprivation 2001 (SAIMD 2001) at Datazone level

- The SAIMD 2001 consists of five dimensions or 'domains' of deprivation, each of which is measured separately at Datazone level:
  - Income and material deprivation (% population deprived)
  - Employment deprivation (% population deprived)
  - Education deprivation (% population deprived)
  - Living environment deprivation (% population deprived)
  - Health deprivation (age/sex standardised mortality)



South African Index of Multiple Deprivation 2001 (SAIMD 2001) at Datazone level

- The SAIMD 2001 consists of five dimensions or 'domains' of deprivation, each of which is measured separately at Datazone level:
  - Income and material deprivation (% population deprived)
- In the SAIMD people are classified as suffering income and material deprivation if they meet one or more of the following criteria:
  (i) 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; or
  (ii) living in a household without a refrigerator; or
  (iii) living in a household with neither a television nor a radio.

Measures of Residential Segregation

- Massey & Denton (1988) identified five dimensions of residential segregation and gave a number of statistical measures of each dimension:
  - Evenness
  - Exposure
  - Concentration
  - Centralisation
  - Clustering

South African Index of Multiple Deprivation 2001 (SAIMD 2001) at Datazone level

Datazones are a statistical geography covering the whole of South Africa. Datazone populations range from 1,000 to 3,000 with a mean of 2,000. There are approx 22,000 Datazones across South Africa as a whole.

Exposure Indices

- The *P** exposure indices measure the extent to which members of one population sub-group are exposed to members of another sub-group.
- For our purpose, we are interested in the extent to which:
  a) the 'poor' are exposed to the 'non-poor'
  b) the 'non-poor' are exposed to the 'poor'
- These measures represent the likelihood that individuals will be exposed to people from the other end of the socio-economic spectrum as they go about their daily lives. May be regarded as proxies for an individual's 'lived experience of inequality'.
- Different variants: 'global', 'geographically weighted' or 'local'.

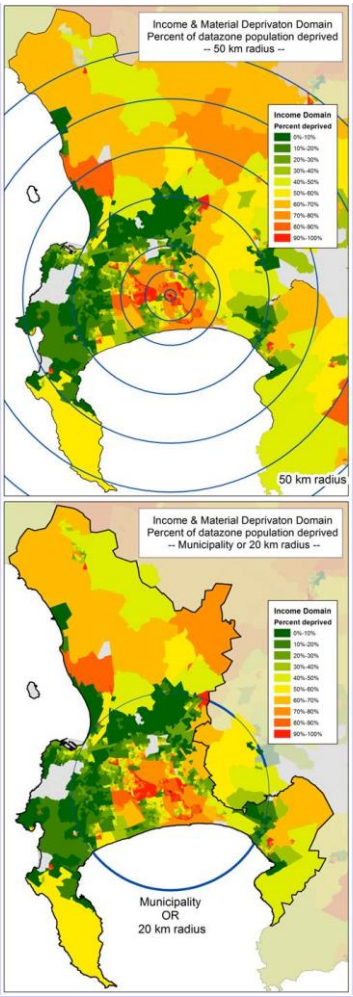
How and where are people exposed to socio-economic inequality?

- Personal interactions with family / friends / colleagues / neighbours / strangers.
- Visual appreciation of differences in wealth and opportunities (e.g. seeking work; driving along a highway).
- Local, national and international media.
- For our purpose, we assume exposure is primarily contoured by people's routine daily activities.

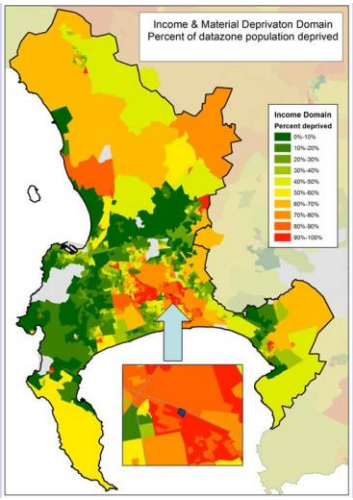
Routine daily activities

For a given person living in a given neighbourhood:

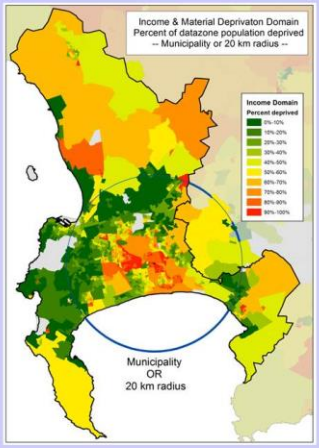
1. How do we set the spatial bounds within which we assume people carry out their daily routine activities and within which they may therefore be exposed to inequality?
2. How do we estimate the likelihood of that person actually visiting each separate constituent neighbourhood within the specified spatial bounds?



Our chosen parameters

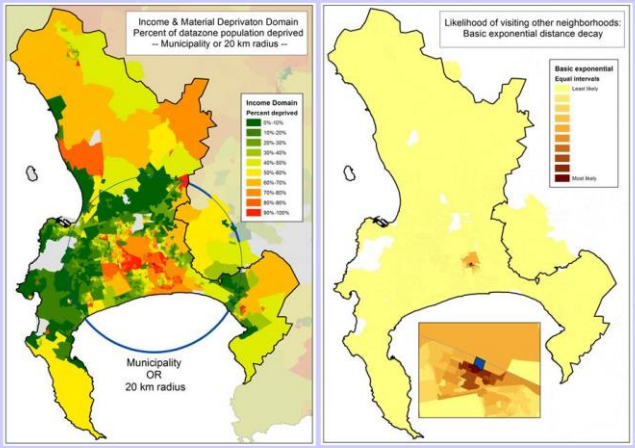


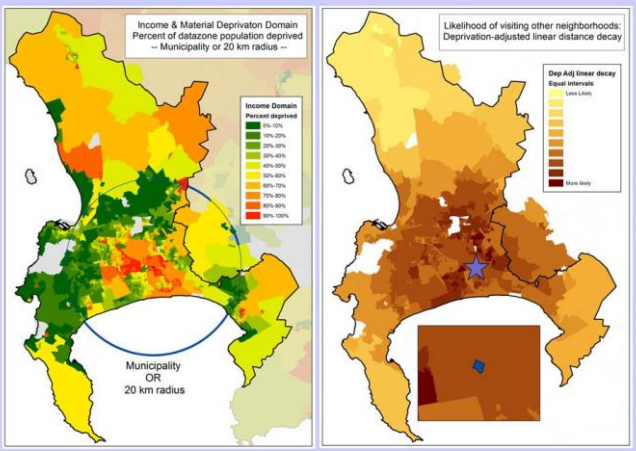
Datazone within Khayelitsha, where > 95% of the pop. is deprived on the Income Domain

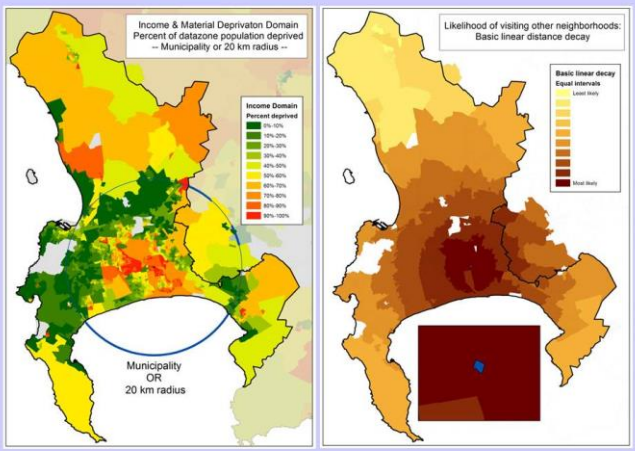


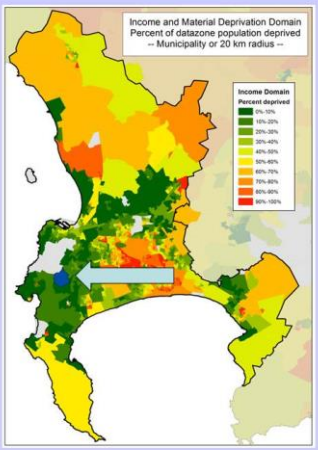
Various different ways to build assumptions as to likelihood of a person actually visiting each constituent neighbourhood within the defined spatial bounds, including:

- Exponential distance decay
- Linear distance decay
- Modified distance decay



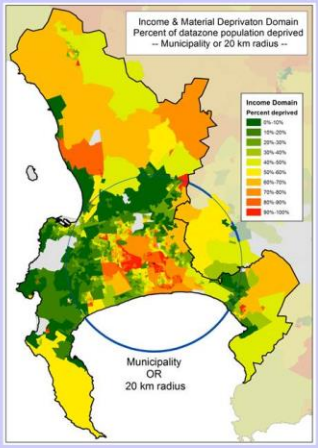






Example datazone in Constantia, where < 5% of population are deprived on the Income Domain

Same methodology, same assumptions regarding spatial bounds and use of 'deprivation adjusted linear distance decay'……



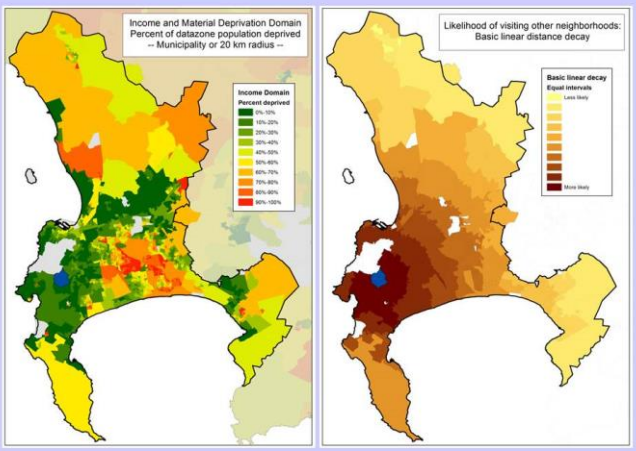
Modified linear distance decay

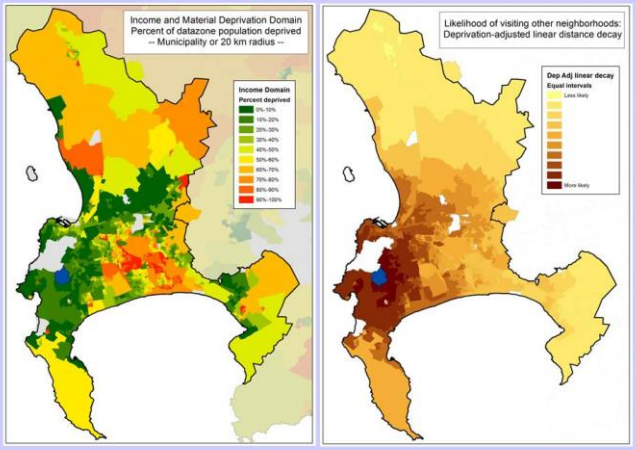
Our starting position is that people's travel patterns are contoured by:

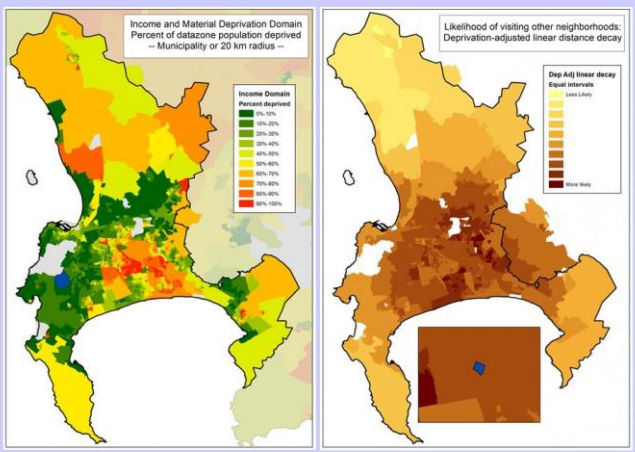
- Needs (e.g. work; study; visiting local administrative functions);
- Opportunities (e.g. seeking work); and
- Barriers (e.g. physical, cultural, perceptions of safety).

In the context of **resources** and therefore **choices**.

Assumption:
- More affluent areas exert stronger 'pull' factors







Summary of exposure measure

Our exposure measure is dependent upon the two inter-related factors of:

1. The likelihood of a given person from a given neighbourhood visiting each separate other neighbourhood within the defined spatial bounds, and
2. The likely level of exposure to inequality the person would experience in each of those separate other neighbourhoods.

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Constructing the deprivation-adjusted linear distance decay weight variable:

$$W_{ij} = \frac{(\max(d_{ij}) - d_{ij})}{\sum_{j=1}^{n}[\max(d_{ij}) - d_{ij})} + \left(\frac{\max(d_{ij}) - d_{ij}}{\sum_{j=1}^{n}[\max(d_{ij}) - d_{ij})} \times \left(\frac{y_j}{t_j} - \frac{y_i}{t_i}\right)\right)$$

$$Z_{ij} = W_{ij} \times \frac{1}{\sum_{j=1}^{n} W_{ij}}$$

where dij is the distance between area i and area j, max(dij) is the maximum distance from area i to any other area j within the specified spatial bounds (i.e. within the local municipality or within 20km of area i), y and t are the numbers of non-poor population and total population, respectively, in areas i and j, Wij is the pre-scaling deprivation-adjusted distance weight between areas i and j, and Zij is the final scaled deprivation-adjusted distance weight between areas i and j.

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Constructing the final exposure measures

$$ExposInc_{xy} = \sum_{j=1}^{n} Z_{ij}\left(\frac{y_j}{t_j}\right)$$

$$ExposInc_{yx} = \sum_{j=1}^{n} Z_{ij}\left(\frac{x_j}{t_j}\right)$$

where Zij is specified as shown in equation (1), x, y and t are the numbers of poor population, non-poor population and total population, respectively, in areas i and j, and $ExposInc_{xy}$ and $ExposInc_{yx}$ are the final local deprivation-adjusted distance-weighted exposure indices for each area i.

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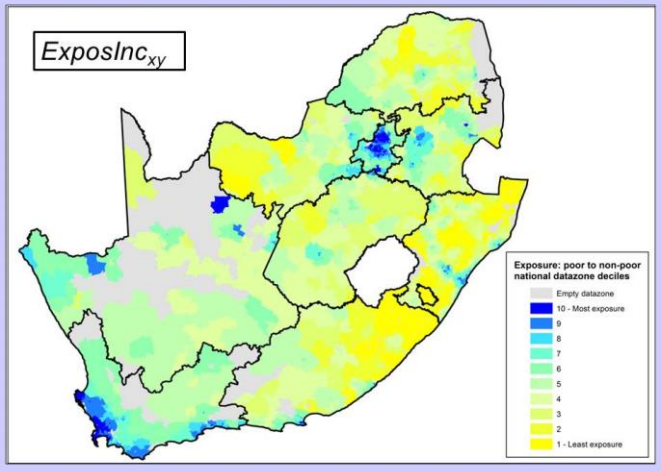


Summary

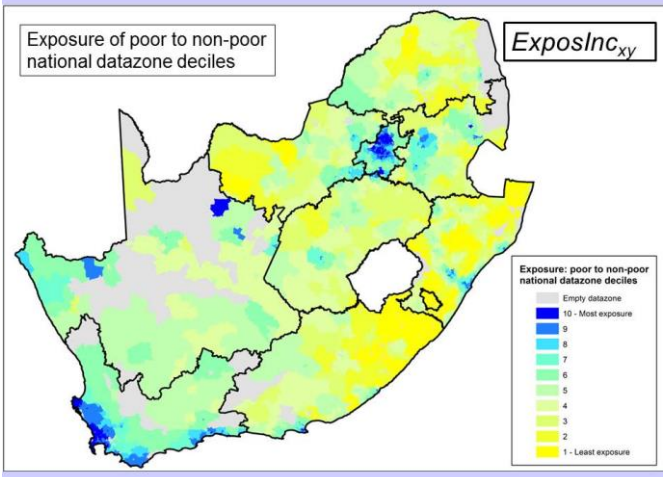
- Exposure indices measure the degree of likely interaction between different population sub-groups.
- We are interested in:
  - the degree to which the poor population is exposed to the non-poor (i.e. the lived experience of inequality from the perspective of the poor)
  - the degree to which the non-poor population is exposed to the poor (i.e. the lived experience of inequality from the perspective of the non-poor)
- 'Local' measures of exposure provide a geographically nuanced picture of variations at neighbourhood level.

Exposure of 'poor' to 'non-poor'

Summary

Assumption: Exposure to socio-economic inequality is related to people's routine activities.

- Our chosen approach involves two components:
  - People's travel patterns are restricted to occurring within their own local municipality and/or within a 20km radius of their home neighbourhood.
  - The likelihood of an individual from one neighbourhood visiting a different neighbourhood is influenced by:
    a) the distance between the neighbourhoods, and
    b) the respective levels of poverty within the neighbourhoods.



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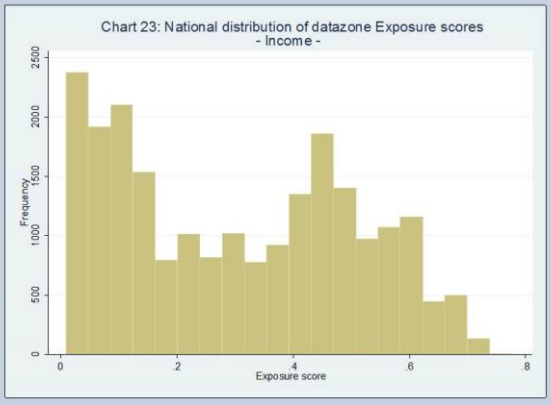
Spatial measures of socio-economic inequality in South Africa

Spatial exposure to inequality: Results

David McLennan, University of Oxford
Michael Noble, Southern African Social Policy Research Institute
Benjamin J. Roberts, Human Sciences Research Council



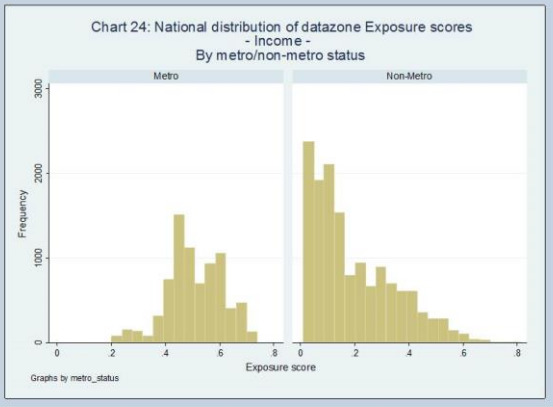
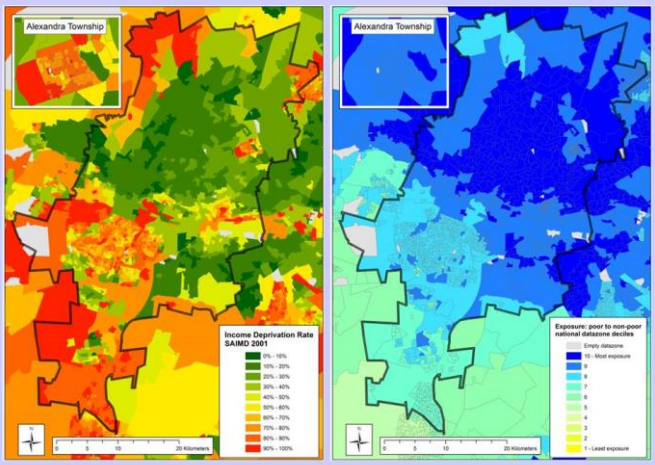


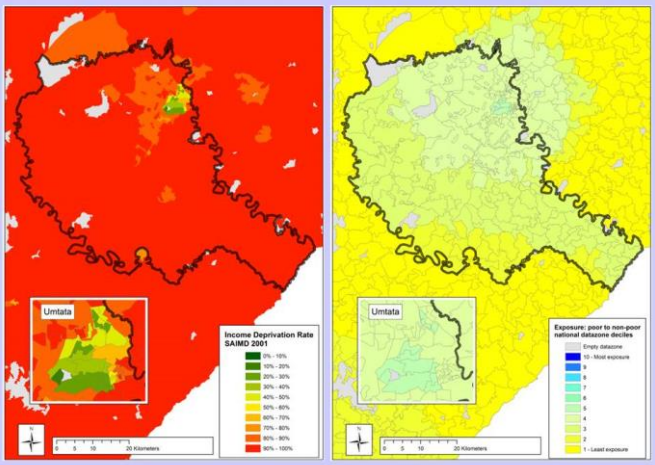
Table 1: Exposure of poor to non-poor: location of datazones in the 10% highest *Exposinc*$_{xy}$ decile nationally

Municipality	Number	Percentage
City of Cape Town	986	44.5
City of Tshwane Metro	502	22.7
City of Johannesburg Metro	290	13.1
Ekurhuleni Metro	206	9.3
Others (23 municipalities)	232	10.5
Total in the 10% highest exposure decile nationally	**2,216**	**100.0**

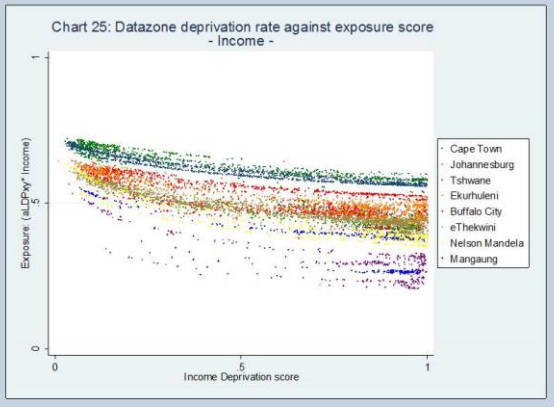
Table 2: Exposure of poor to non-poor: location of the ten municipalities with the largest proportions of datazones in the highest *Exposinc*$_{xy}$ decile nationally

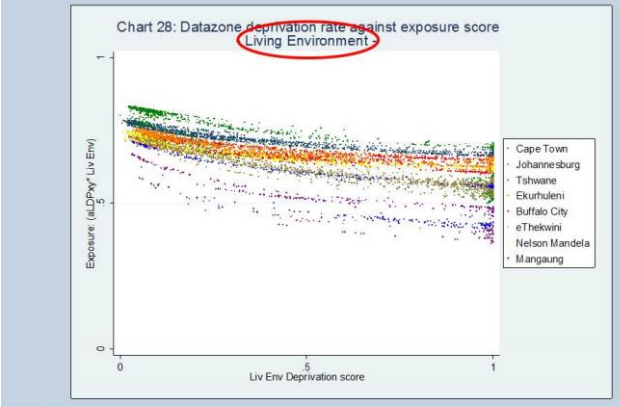
Municipality	Number of datazones in the municipality	Number of datazones in the 10% highest *Exposinc*$_{xy}$ decile nationally	Percentage of municipality datazones in the 10% highest *Exposinc*$_{xy}$ decile nationally
Gamagara	9	7	77.8%
Stellenbosch	60	44	73.3%
City of Cape Town	1388	986	71.0%
Saldanha Bay	34	23	67.6%
City of Tshwane Metro	951	502	52.8%
Mossel Bay	37	10	27.0%
City of Johannesburg Metro	1599	290	18.1%
George	67	12	17.9%
Ekurhuleni Metro	1188	206	17.3%
Nokeng tsa Taemane	21	3	14.3%

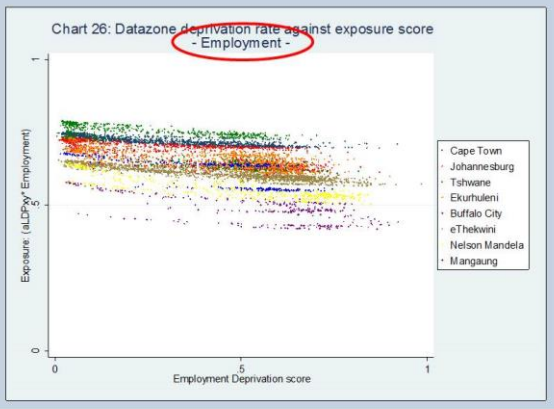


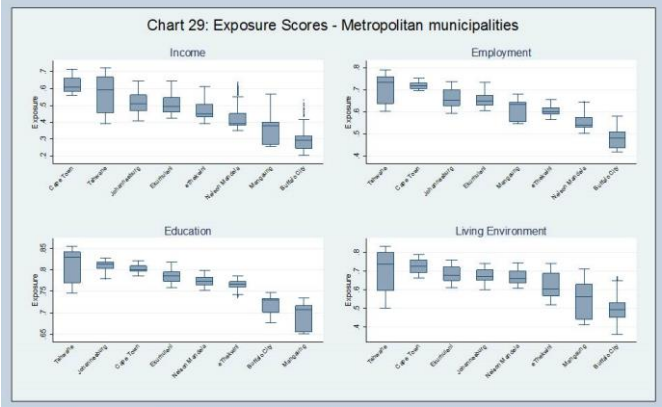


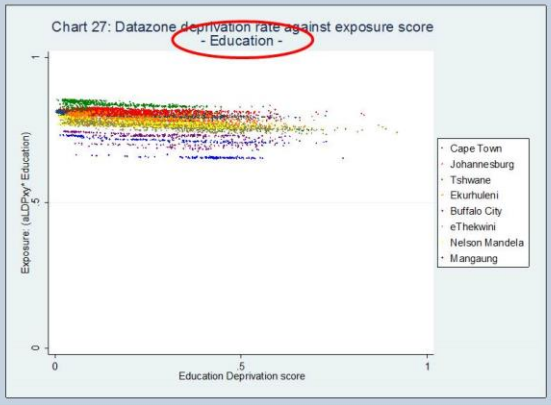
Focus on the metropolitan municipalities
(Exposure of 'poor' to 'non-poor')











Tables 3 & 4: Spearman rank correlation coefficients between the four dimension-specific exposure measures

Table 3: All metropolitan datazones (n=7,800)

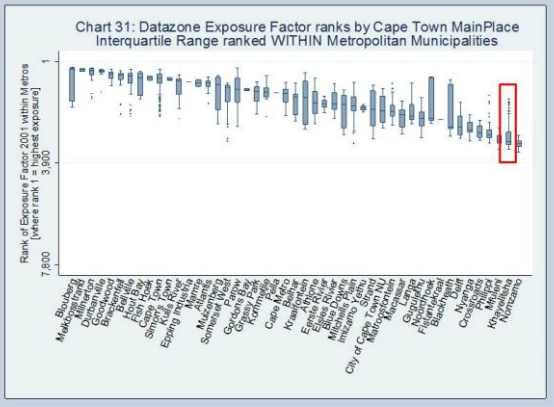
	Expos_Inc	Expos_Emp	Expos_Edu	Expos_Liv
Expos_Inc	1			
Expos_Emp	0.9171	1		
Expos_Edu	0.8104	0.8281	1	
Expos_Liv	0.8947	0.7821	0.7225	1

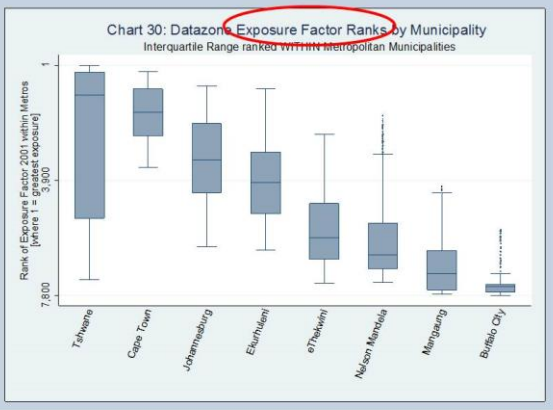
Table 4: City of Cape Town datazones only (n=1,388)

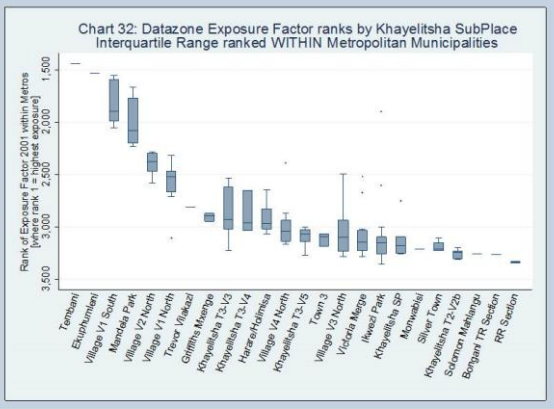
	Expos_Inc	Expos_Emp	Expos_Edu	Expos_Liv
Expos_Inc	1			
Expos_Emp	0.9344	1		
Expos_Edu	0.8752	0.8861	1	
Expos_Liv	0.9339	0.8592	0.8116	1

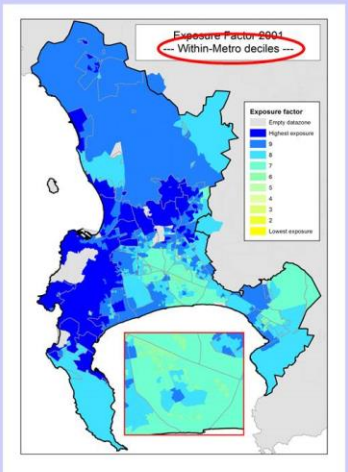
Creating $ExposFac_{xy}$

1. Each of the four separate dimension-specific exposure scores at Datazone level was ranked and transformed to a normal distribution.
2. The four normalised rank variables were entered into a maximum likelihood factor analysis.
3. Weights derived from the factor analysis were used to combine the four normalised rank variables to form a single composite measure at Datazone level: '$ExposFac_{xy}$'.
4. The 7,800 metropolitan Datazones were re-ranked on the $ExposFac_{xy}$ measure.





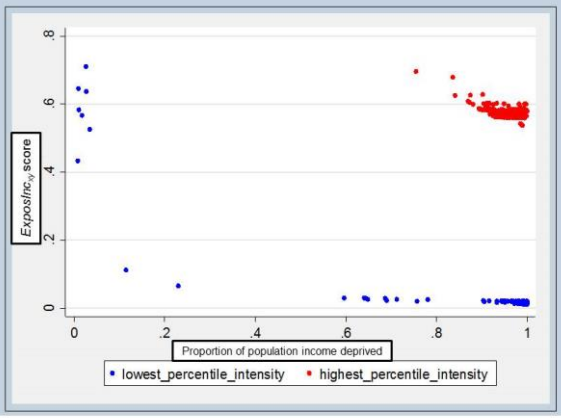




Summary of Exposure results

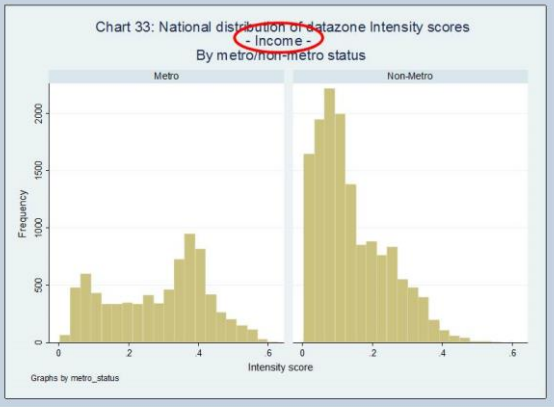
- Exposure to socio-economic inequality is typically highest in the urban areas, particularly the metropolitan municipalities.
- There are strong correlations at datazone level between the four separate dimension-specific measures of exposure (income, employment, education, living environment)
- The composite $ExposFac_{xy}$ measure constructed across the 7,800 metropolitan datazones shows that exposure is typically highest in Tshwane and Cape Town, but that there is far more variation within Tshwane than within Cape Town.
- The exposure results can be analysed at a detailed geographical level to explore variations *within* municipalities.

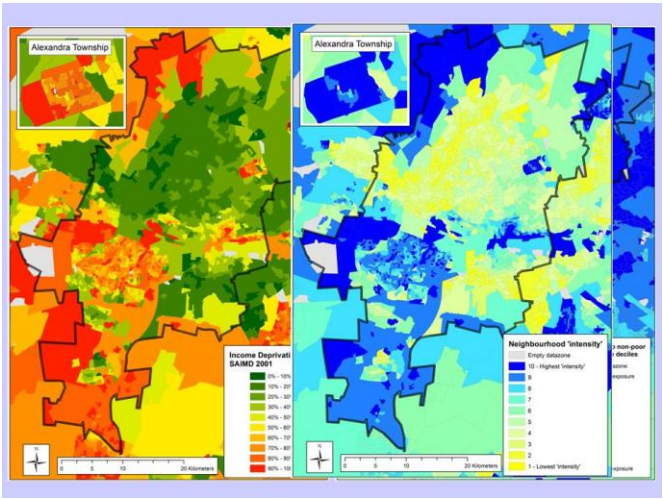
Community 'Intensity' of exposure ('poor' to 'non-poor'): National analyses



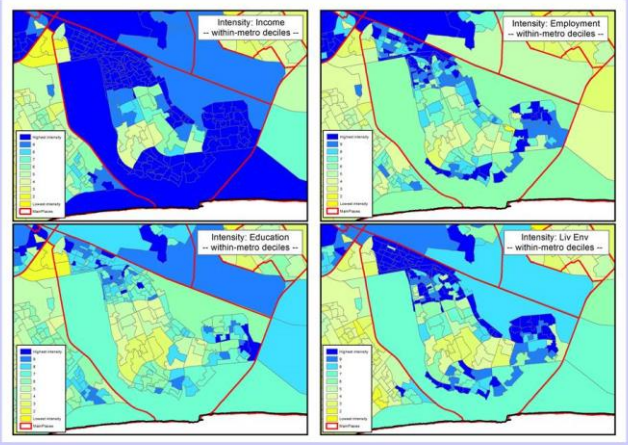
Neighbourhood 'Intensity' of exposure to socio-economic inequality

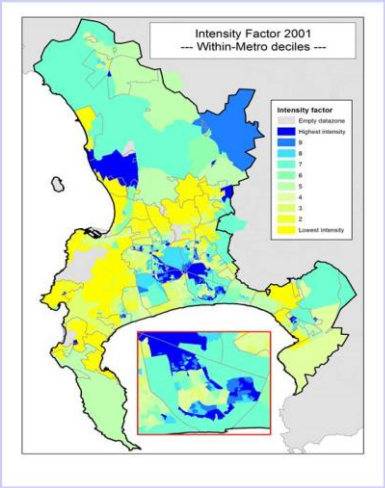
- The exposure measures represent the likelihood of a given individual living in a given neighbourhood of being exposed to socio-economic inequality.
- Typically, a geographical area with low poverty rates (e.g. Sandton) will be characterised by relatively high levels of exposure amongst the poor population.
- But some neighbourhoods (e.g. Alexandra) have high poverty **and** high exposure to inequality.
- In these areas, it may be argued there is a high community-level 'intensity' of exposure to inequality.





Intensity of exposure ('poor' to 'non-poor'): Focus on the metropolitan municipalities

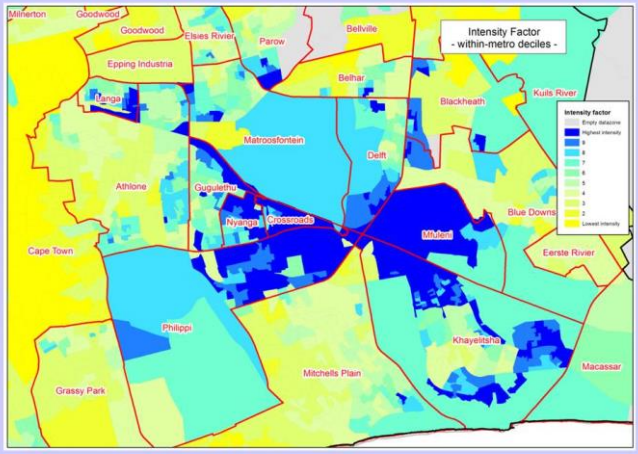


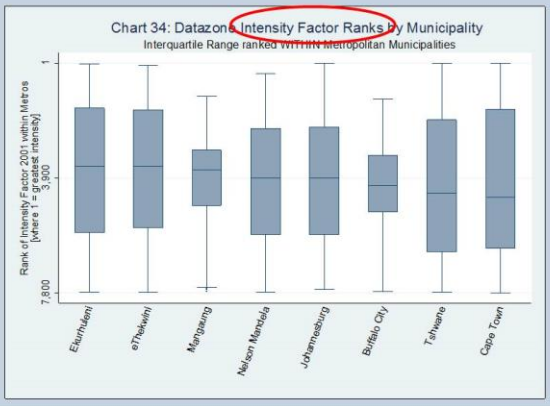


Tables 5 & 6: Spearman rank correlation coefficients between the four dimension-specific 'intensity' measures

Table 5: All metropolitan datazones				
All Metros	intensity_inc	intensity_emp	intensity_edu	intensity_liv
intensity_inc	1			
intensity_emp	0.8245	1		
intensity_edu	0.7960	0.7068	1	
intensity_liv	0.8810	0.7529	0.8399	1

Table 6: City of Cape Town datazones only				
Just Cape Town	intensity_inc	intensity_emp	intensity_edu	intensity_liv
intensity_inc	1			
intensity_emp	0.9329	1		
intensity_edu	0.8666	0.8122	1	
intensity_liv	0.9320	0.8780	0.8402	1





Summary of 'Intensity' results

- 'Intensity' can be regarded as a measure of the degree to which neighbourhoods are characterised by the twin stressors of high poverty and high exposure to socio-economic inequality.
- High correlations exist between the four dimension-specific intensity measure, justifying the construction of an '$IntensityFac_{xy}$' composite measure.
- Datazone neighbourhoods with very high levels of 'intensity' are found in all metropolitan municipalities.
- All eight metro municipalities exhibit a wide range of datazone level intensity scores, i.e. heterogeneity.

Conclusions

- Spatial inequality measures – particularly the *P** Exposure indices – offer a valuable contribution to the evidence base concerning inequality in South Africa.
- They provide a means to examine geographical patterns in people's lived experience of inequality.
- They can be used as explanatory factors when analysing attitudinal data (as is the focus of the ESRC/NRF-funded project).
- They can also be used to identify geographical areas characterised by both high levels of poverty and high levels of exposure to inequality, which may be most at risk of social unrest or high levels of crime (our 'Safe and Inclusive Cities' project).

The relationship between spatial inequality and attitudes to inequality in South Africa

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University of Oxford

Ben Roberts, Temba Masilela & Hope Magidimisha
Human Sciences Research Council

Are people's attitudes to inequality influenced by their exposure to inequality?

Outline

- Key research questions
- Data preparation
- Model development
- Results
- Conclusions and policy implications

Key research questions

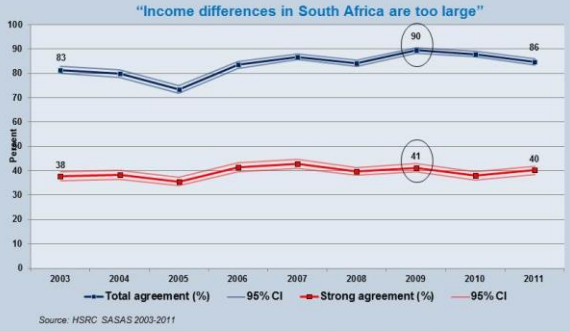
- SASAS 2009, Q186: "To what extent do you agree or disagree that differences in income in South Africa are too large?"
- SASAS 2009, Q187: "To what extent do you agree or disagree that it is the responsibility of the government to reduce the differences in income between people with high incomes and those with low incomes?"

What role, if any, does exposure to inequality play in shaping people's responses to these two questions?

Model matrix

		Poor/non-poor perspective	
		poor	non-poor
Dependent variable	ineqavr	Model A	Model B
	govredr	Model C	Model D

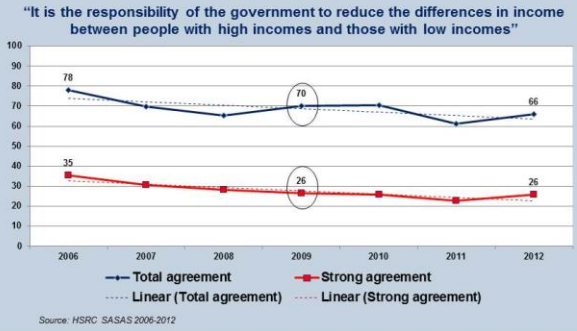
Aversion to Income Inequality



Data preparation

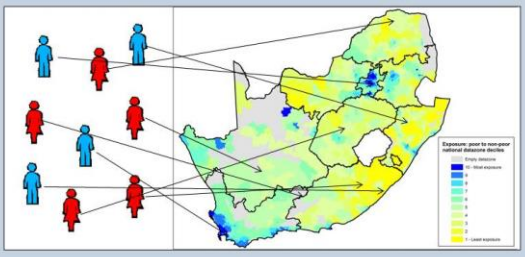
1) Data linkage [SASAS ← Exposure]
2) Selecting control variables
3) Splitting linked dataset into two subsets: poor respondents / non-poor respondents

Preferences for Redistribution



Data linkage

SASAS respondents ← Enumeration Area code ? ← Datazone-level exposure



Selecting control variables

- SASAS 2009 questionnaire reviewed for potentially important control variables.
- A 'manageable' number of potentially important variables were identified and extracted to generate base modelling dataset.
- Variables spanned themes such as: demographics; objective personal life status; subjective personal life status and dynamics; perceptions of inter-group societal tensions; views on individualistic vs structural factors underpinning success; political views; and geographical identifiers.

Splitting SASAS into poor / non-poor subsets

- SASAS 2009 contained 3156 respondent cases.
- Modelling requires split of 73% 'poor' and 27% 'non-poor'.
- SASAS does contain a question on income, but many missing cases mean this is not a reliable variable.
- SASAS contains a series of questions relating to material asset ownership → derived 'assetindex' enabling respondents to be ranked from 'lowest asset ownership' to 'highest asset ownership'.
- 73% lowest asset ownership → 'poor' SASAS subgroup (2110 cases, based upon cumulative benchweight values).
- 27% highest asset ownership → 'non-poor' SASAS subgroup (1036 cases, based upon cumulative benchweight values).

Variable name	Variable type	Variable description
uniqueid	-----	Individual survey respondent unique identifier code
benchwgt	-----	Composite survey weight
ineqavr	Ordinal	Q186. To what extent do you agree or disagree that differences in income in South Africa are too large?
govredr	Ordinal	Q187. To what extent do you agree or disagree that it is the responsibility of the government to reduce the differences in income between people with high incomes and those with low incomes?
age	Numerical	Q238. Age of respondent in completed years.
agesq	Numerical	Derived 'Aged squared' indicator, based on Q238
race	Categorical	Respondent's population group (taken from 'respondent selection procedure' questions).
marstat	Categorical	Q239. What is your current marital status?
hhper	Numerical	Number of persons in this household (taken from 'respondent selection procedure' questions)
assetindex	Numerical	Derived 'Asset Index' indicator, based on 25 separate items (Q267-Q300) e.g. Q281. Does your household have a washing machine (in working order)?
edu	Categorical	Q242. What is the highest level of education that you have ever completed?
empl	Categorical	Q246. What is your current employment status?
spoor	Ordinal	Q151. Would you say that you and your family are... e.g. 'wealthy/very comfortable'
topbott00	Numerical	Derived indictor (transformed to 0-100 scale) based on Q198. In our society there are groups which tend to be towards the top and groups which tend to be towards the bottom. Where would you put yourself on a scale of 1 to 10, where 10 is the top and 1 the bottom?
ssocmobc	Ordinal	Q2. In the last 5 years, has life improved, stayed the same or gotten worse for people like you?
futmob	Ordinal	Q3. Do you think that life will improve, stay the same or get worse in the next 5 years for people like you?
jobprest	Ordinal	Q200. Please think about your present job (or your last one if you don't have one now). If you compare this job to the job your father had when you were 15, would you say that the level of status of your job is (or was)... e.g. 'Much higher than your father's'
classconind	Numerical	Derived 'Class conflict index' indicator, based on multiple separate items, e.g. Q195. In your opinion, in South Africa how much conflict is there between the working class and the middle class?
groupdis	Ordinal	Q35. Would you describe yourself as being a member of a group that is discriminated against in this country?
meritind	Numerical	Derived 'Merit factor index', based on multiple separate items, e.g. Q164. How important is hard work for getting ahead in life?
exogind	Numerical	Derived 'Exogenous factors index', based on multiple separate items, e.g. 160. How important is coming from a wealthy family for getting ahead in life?
qlstr	Ordinal	Q168. How important is a person's race for getting ahead in life?
polideol	Categorical	Q235. In political matters, people talk of "the left" and "the right" or 'liberal' and 'conservative'. Where would you place your views on this scale?
anc	Ordinal	Derived 'ANC voter' indicator based on Q231. If there were a national election tomorrow, for which party would you vote?
geotype	Categorical	Statistics South Africa Census 2001 enumeration area Geotype classification
dz_code	-----	Datazone unique identifier code
mun_name	-----	Municipality name
prov	-----	Province name
exposure_of_poor	Ratio	aLDPyxi* exposure to inequality measure developed above in Chapter 2
exposure_of_rich	Ratio	aLDPyxi* exposure to inequality measure developed above in Chapter 2
inc	Ratio	Proportion of datazone population that is classified as being deprived on the 'Income and Material Deprivation Domain' of the SAIMD 2001 at datazone level

Model development

- The two dependent variables ('ineqavr' and 'govredr') are both on 5-point ordinal scales.
- Cumulative link ordered logit regression models required.
- Tests showed that multilevel models required due to the geographical stratification employed in the SASAS sampling method.
- All models developed and implemented in the R statistical software package using the 'clmm' function from the ordinal library.

Splitting SASAS into poor / non-poor subsets

- The exposure measures utilise the dichotomous classification of 'poor' / 'non-poor' as defined for the Income and Material Deprivation Domain of the South African Index of Multiple Deprivation 2001 at Datazone level (SAIMD 2001) (Noble et al, 2009).
- According to the SAIMD 2001, across South Africa as a whole, 73% of the population is classified as deprived (i.e. 'poor') on the Income and Material Deprivation Domain, with the remaining 27% of the population regarded as being not deprived (i.e. 'non-poor') on this domain.
- The 'exposure_of_poor' explanatory variable is only relevant for 'poor' SASAS respondents.
- The 'exposure_of_rich' explanatory variable is only relevant for 'non-poor' SASAS respondents.

Model development

- Four models produced:
- Each model started with the full complement of (model-appropriate) explanatory variables listed above.

		Poor/non-poor perspective	
		poor	non-poor
Dependent variable	ineqavr	Model A	Model B
	govredr	Model C	Model D

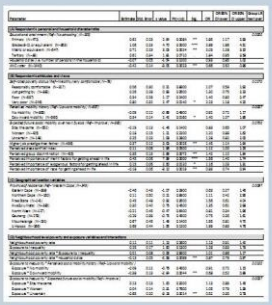
- Multilevel component consisted of three nested levels:
  - Individual respondent
  - Datazone
  - Local municipality
- Ordinal and categorical variables treated as factors, while numeric and ratio variables were standardised by subtracting the mean and dividing by the standard deviation.

Model development

Greenland, S. (1989) 'Modelling and variable selection in epidemiologic analysis', *American Journal of Public Health*, Vol. 79, No. 3, pp 340-349.

- Start with full complement of explanatory variables in base modelling file.
- Sequentially drop one variable at a time based upon the likelihood ratio (LR) test p-value until each variable remaining in the model had an LR p-value < 0.05.
  - Except: the explanatory variables relating to experience of inequality ('exposure_of_poor' or 'exposure_of_rich') and neighbourhood poverty rate ('inc') and the interaction term between them would be retained in the model regardless of LR test p-value.
- Sequentially add interaction terms containing exposure or poverty rate if the associated LR test p-value for the interaction was <0.05.

Results: Model A
Inequality aversion amongst the poor subgroup



Respondent's personal and household characteristics

Respondent's attitudes and views

Geographical location

Neighbourhood-level poverty and exposure variables, plus relevant interactions

Model development – final specifications

Model_A <- clmm(ineqavr ~ exposP + log_incS + (log_incS:exposP) + edu + hhperS + spoor + groupdis + ssocmobc + jobprest + futmob + classconindS + meritindS + exogindS + q168rS + anc + prov + (exposP:ssocmobc) + (exposP:futmob) + (log_incS:hhperS) + (1|mun_name/dz_code), weights = 2120*wt, data = poor_i, Hess = T, na.action = na.omit)

Model_B <- clmm(ineqavr ~ exposR + log_incS + (log_incS:exposR) + race + edu + empl + spoor + groupdis + ssocmobc + jobprest + classconindS + topbott100S + prov + (exposR:race) + (exposR:spoor) + (log_incS:ssocmobc) + (1|mun_name/dz_code), weights = 1036*wt, data = rich_i, Hess = T, na.action = na.omit)

Model_C <- clmm(govredr ~ exposP + log_incS + (log_incS:exposP) + empl + spoor + groupdis + jobprest + classconindS + meritindS + exogindS + q168rS + polideol + ineqavrS + (exposP:empl) + (exposP:spoor) + (1 | mun_name/dz_code), weights = 2120*wt, data = poor_g, Hess = T, na.action = na.omit)

Model_D <- clmm(govredr ~ exposR + log_incS + (log_incS:exposR) + marstat + ssocmobc + futmob + anc + polideol + assetindexS + ineqavrS + (exposR:polideol) + (1|mun_name/dz_code), weights = 1036*wt, data = rich_g, Hess = T, na.action = na.omit)

Note: the dependent and independent variables are described above (with the adapted notation of suffixing continuous variables with an upper-case 'S' to signify that the variable has been standardised, and renaming the variable 'exposure_of_poor' to 'exposP' and the variable 'exposure_of_rich' to 'exposR').

Model A: neighbourhood-level poverty and exposure variables, plus relevant interactions

Parameter	Estimate	Std. Error	z value	Pr(>|z|)	Sig.	OR	OR 95% CI lower	OR 95% CI upper	Group LR test pval
(D) Neighbourhood level poverty and exposure variables and interactions									
Neighbourhood poverty rate	0.12	0.11	1.13	0.2600		1.13	0.91	1.40	
Exposure to inequality	0.25	0.17	1.50	0.1300		1.29	0.93	1.79	
Neighbourhood poverty rate * Exposure to inequality	0.01	0.08	0.09	0.9300		1.01	0.86	1.17	
Neighbourhood poverty rate * Household size	-0.13	0.05	-2.58	0.0099	**	0.87	0.79	0.97	
*Exposure to inequality * Perceived social mobility history (Ref='Upward mobility')*									*0.0120*
Exposure * No mobility	-0.09	0.12	-0.76	0.4500		0.91	0.72	1.15	
Exposure * Downward mobility	-0.38	0.13	-2.84	0.0044	**	0.68	0.52	0.89	
*Exposure to inequality * Expected future social mobility (Ref='Improve')*									*0.0037*
Exposure * Stay the same	0.13	0.13	1.00	0.3200		1.13	0.89	1.45	
Exposure * Worsen	0.04	0.14	0.31	0.7600		1.05	0.79	1.39	
Exposure * Uncertain	-0.65	0.20	-3.18	0.0014	**	0.52	0.35	0.78	

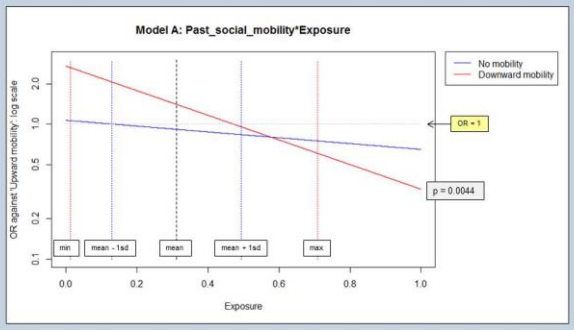
* significant at p < 0.05; ** significant at p < 0.01; *** significant at p < 0.001

Results

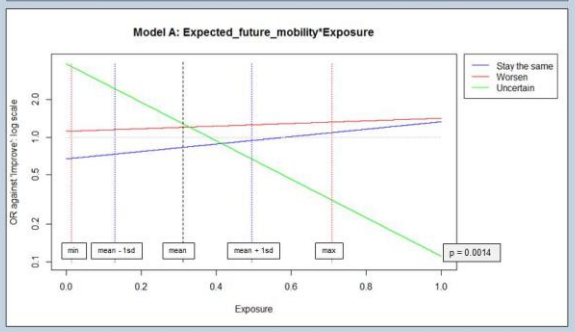
The focus in this presentation is on Models A & C (i.e. attitudes towards inequality amongst the 'poor' sub-group of the population).

The accompanying project research report contains the full series of results from all four models.

Model A: inequality aversion, poor subgroup
*Exposure to inequality * Perceived social mobility history*



Model A: inequality aversion, poor subgroup
*Exposure to inequality * Expected future social mobility*



Model C: neighbourhood-level poverty and exposure variables, plus relevant interactions

Parameter	Estimate	Std. Error	z value	Pr(>|z|)	Sig.	OR	OR 95% CI lower	OR 95% CI upper	Group LR test pval
(D) Neighbourhood level poverty and exposure variables and interactions									
Neighbourhood poverty rate	0.01	0.11	0.12	0.9000		1.01	0.82	1.25	
Exposure to inequality	-0.49	0.29	-1.69	0.0920	.	0.61	0.35	1.08	
Neighbourhood poverty rate * Exposure to inequality	-0.11	0.08	-1.38	0.1700		0.90	0.77	1.05	
*Exposure * Employment status (Ref='Employed full time')*									*0.0045*
Exposure * Employed part time	0.75	0.22	3.32	0.0009	***	2.11	1.36	3.27	
Exposure * Unemployed, seeking work	0.12	0.15	0.84	0.4000		1.13	0.85	1.51	
Exposure * Unemployed not looking for work	0.40	0.19	2.07	0.0390	*	1.50	1.02	2.19	
Exposure * Pensioner	0.18	0.19	0.93	0.3500		1.20	0.82	1.74	
Exposure * Student/learner	0.18	0.18	0.96	0.3300		1.19	0.83	1.70	
Exposure * Permanently sick/disabled	0.90	0.39	2.32	0.0200	*	2.45	1.15	5.23	
Exposure * Other employment status	0.67	0.28	2.45	0.0140	*	1.96	1.14	3.37	
*Exposure * Self-rated poverty status (Ref='Wealthy/very comfortable')*									*0.0020*
Exposure * Reasonably comfortable	0.02	0.28	0.08	0.9300		1.02	0.59	1.78	
Exposure * Just getting by	0.58	0.26	2.19	0.0290	*	1.78	1.06	2.99	
Exposure * Poor	0.32	0.27	1.19	0.2300		1.38	0.81	2.33	
Exposure * Very poor	0.36	0.30	1.19	0.2300		1.44	0.79	2.60	

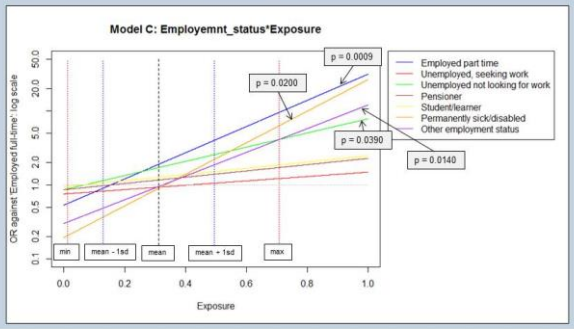
* significant at p < 0.05; ** significant at p < 0.01; *** significant at p < 0.001

Summary: Model A

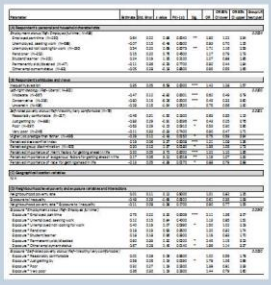
Model A: inequality aversion from perspective of the 'poor'

- In Model A, the only two statistically significant interaction terms shown in the figures both exhibit negative associations with exposure, meaning that, as exposure increases, respondents in these two groups show progressively less aversion to income inequality than the respective reference groups.

Model C: government redistribution, poor subgroup
*Exposure to inequality * Employment status*



Results: Model C
Agreement amongst the poor subgroup that the government has a responsibility for income redistribution

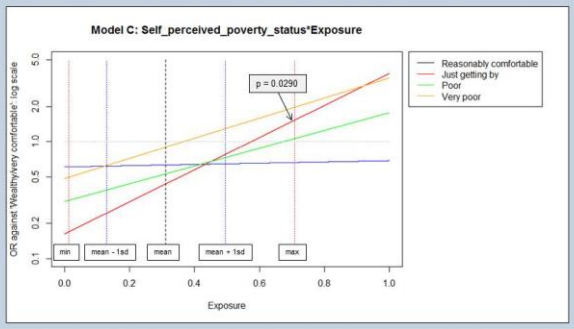


Respondent's personal and household characteristics

Respondent's attitudes and views

Neighbourhood-level poverty and exposure variables, plus relevant interactions

Model C: government redistribution, poor subgroup
*Exposure to inequality * Self-perceived poverty status*



Summary: Model C

Model C: support for government role in income redistribution, from perspective of the 'poor'

- In Model C, all five of the **statistically significant interactions** shown in the figures exhibit **positive associations with exposure**, meaning that, as exposure increases, respondents of these five groups become progressively more supportive of government's role in income redistribution relative to the reference categories.
- However, all these five interactions suggest that **at the lowest actually observed exposure level, people in these groups are less supportive than the respective reference group** (although the odds ratios for some of the employment status groups are only slightly below 1 at the low-exposure extreme).

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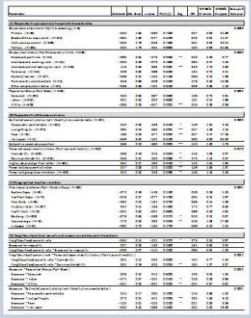
Conclusions

- Statistical models designed to test whether exposure to socioeconomic inequality affects attitudes to inequality and options for redress.
- Basic hypothesis: exposure to inequality -> heightened awareness of inequality -> increased sense of social injustice -> greater aversion to income inequality & stronger belief that the government has a responsibility to reduce inequality through income redistribution.
- Models demonstrated that exposure to inequality *does* seem to exert some effect on people's attitudes to inequality and options for redress, but the effects are primarily observable through the interaction of exposure with other explanatory variables.
- Limitation of the data: there is generally a strong consensus amongst survey respondents that inequality is too high and that the government has a responsibility to reduce it through income distribution. Therefore not a great deal of discrimination between response categories on our two dependent variables.
- Recommendation: consider including additional new SASAS questions to provide greater discrimination between response categories.

Results: Model B
Inequality aversion amongst the non-poor subgroup



- Respondent's personal and household characteristics
- Respondent's attitudes and views
- Geographical location
- Neighbourhood-level poverty and exposure variables, plus relevant interactions

Conclusions

- ESRC Pathfinder Inequality project: experimental in conception and fairly focused in scope
- Apart from **contributing to a better understanding of inequality** based on the development of new small area inequality measures and an in-depth examination of attitudes towards in inequality in the country…
- …the study is an **example of the utility of combining different types of data** to produce new insights about the intersection of inequality, space and social beliefs.
- Clearly a **need for further experimentation of this type** to produce policy-relevant evidence on the interplay between spatial inequality and citizen attitudes, as well as other aspects of social life and its dynamics.

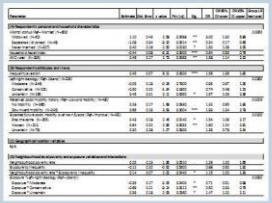
Model B: neighbourhood-level poverty and exposure variables, plus relevant interactions

Parameter	Estimate	Std. Error	z value	Pr(>|z|)	Sig.	OR	OR 95% CI lower	OR 95% CI upper	Group LR test pval
(0) Neighbourhood level poverty and exposure variables and interactions									
Neighbourhood poverty rate	-0.32	0.14	-2.21	0.0270	*	0.73	0.55	0.97	
Exposure to inequality	0.27	0.23	1.20	0.2300		1.31	0.84	2.04	
Neighbourhood poverty rate * Exposure to inequality	-0.08	0.07	-1.14	0.2600		0.93	0.81	1.06	
*Neighbourhood poverty rate * Perceived social mobility history (Ref='Upward mobility')*									*0.0025*
Neighbourhood poverty rate * No mobility	0.04	0.15	0.26	0.8000		1.04	0.77	1.40	
Neighbourhood poverty rate * Downward mobility	0.61	0.19	3.22	0.0013	**	1.84	1.27	2.67	
*Exposure * Population Group (Ref='Black')*									*0.0052*
Exposure * Coloured	0.03	0.24	0.12	0.9000		1.03	0.64	1.66	
Exposure * Indian	-0.74	0.37	-2.01	0.0440	*	0.48	0.23	0.98	
Exposure * White	-0.61	0.20	-3.01	0.0026	**	0.54	0.37	0.81	
*Exposure * Self-rated poverty status (ref='Wealthy/very comfortable')*									*0.0001*
Exposure * Reasonably comfortable	0.15	0.17	0.85	0.4000		1.16	0.83	1.62	
Exposure * Just getting by	0.72	0.21	3.41	0.0006	***	2.05	1.36	3.10	
Exposure * Poor	-1.56	0.61	-2.56	0.0100	*	0.21	0.06	0.69	
Exposure * Very poor	-3.00	3.05	-0.98	0.3300		0.05	0.00	19.69	

* significant at p < 0.05; ** significant at p < 0.01; *** significant at p < 0.001

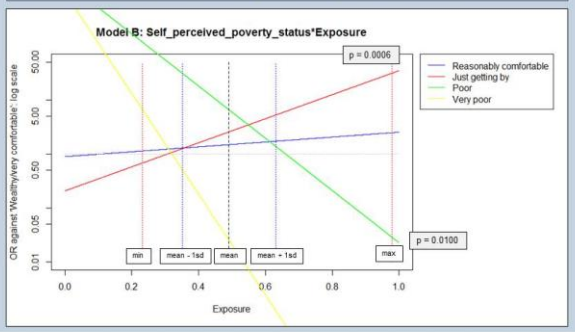
Model B: inequality aversion, non-poor subgroup
*Exposure to inequality * Race*

Results: Model D
Agreement amongst the non-poor subgroup that the government has a responsibility for income redistribution



- Respondent's personal and household characteristics
- Respondent's attitudes and views
- Neighbourhood-level poverty and exposure variables, plus relevant interactions

Model B: inequality aversion, non-poor subgroup
*Exposure to inequality * Self-perceived poverty status*

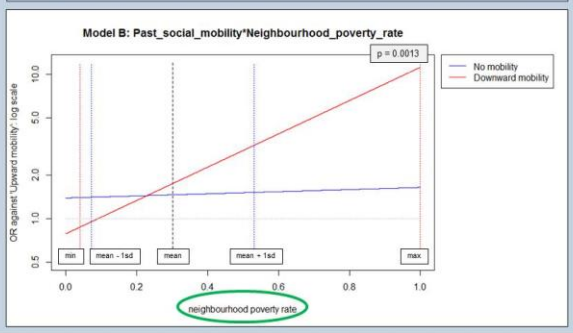


Model D: neighbourhood-level poverty and exposure variables, plus relevant interactions

Parameter	Estimate	Std. Error	z value	Pr(>|z|)	Sig.	OR	OR 95% CI lower	OR 95% CI upper	Group LR test pval
(D) Neighbourhood level poverty and exposure variables and interactions									
Neighbourhood poverty rate	0.25	0.13	1.95	0.0510	.	1.29	1.00	1.66	
Exposure to inequality	-0.12	0.20	-0.62	0.5300		0.88	0.60	1.30	
Neighbourhood poverty rate * Exposure to inequality	0.14	0.07	2.02	0.0440	*	1.15	1.00	1.33	
*Exposure * Left-right ideology (Ref='Liberal')*									*0.0000*
Exposure * Moderate	-0.35	0.17	-2.05	0.0400	*	0.71	0.51	0.98	
Exposure * Conservative	-0.69	0.21	-3.24	0.0012	**	0.50	0.33	0.76	
Exposure * Uncertain	0.39	0.18	2.09	0.0360	*	1.47	1.02	2.11	

* significant at p < 0.05; ** significant at p < 0.01; *** significant at p < 0.001

Model B: inequality aversion, non-poor subgroup
Neighbourhood poverty rate Perceived social mobility history*



Model D: gov redistribution, non-poor subgroup
*Exposure to inequality * Political ideology*