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A multidimensional analysis of poverty in South Africa since the transition (1996-2007) using the fuzzy sets approach

by

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DECLARATION

I declare that *A multidimensional analysis of poverty in South Africa since the transition (1996-2007) using the fuzzy sets approach* is my own work, that it has not been submitted for any degree or examination in any university, and that all the sources that I have used or quoted have been indicated and acknowledged by complete references.

Rochelle Gloria Gallant

Signature: .....

Date: 15 November 2012

ABSTRACT

KEYWORDS: Multidimensional poverty, deprivation, money-metric, non-money-metric, poverty measurement, fuzzy sets, wellbeing, South Africa

With the transition to a democratic society, one of the challenges to emerge was to provide economic freedoms for all – that is, freedom from isolation, freedom from powerlessness, freedom from hunger, and freedom from poverty. Fighting poverty has always been high on the agenda of the democratic government since the transition. Numerous measures and policies were instituted aimed at reducing poverty. Researchers initiated serious efforts to try and understand the nature and extent of poverty, through various studies being conducted. Many of these studies focused only on money-metric measures, despite the fact that poverty is a multidimensional concept. What has resulted are various poverty-measurement methods producing different results on the extent of poverty. In addition, certain aspects of these money-metric approaches have serious shortcomings. The fuzzy sets approach addresses many of these shortcomings, as it is a multidimensional approach. Few studies have used this approach to measure poverty in South Africa. This thesis plans to use this method to analyse poverty levels and trends in South Africa, focusing on multidimensional, non-money-metric poverty. Data from Census 1996, Census 2001 and Community Survey 2007 will be used for the study.

From the results of the analysis it was established that there is some divergence in the findings of money-metric approaches and those of fuzzy sets. A key result to emerge is the difference in poverty trends over the period 1996 – 2007. Most studies reviewed in Chapter Three that used the money-metric approach showed that poverty trends were upward in the 1990s, before a downward trend took place in the 2000s. This took place irrespective of the survey data used. The non-money-metric poverty trends derived in this chapter, however, show a continuous downward trend over the period. The overall mean deprivation in South Africa has declined since 1996. For people residing in provinces such as Limpopo, the Eastern Cape and KwaZulu-Natal, they are more likely to be poor under the fuzzy sets approach. This may be an indication of inadequate service delivery and the extent to which recent government measures to address poverty have been successful or not. In terms of race, blacks still have the highest mean deprivation, but enjoyed the biggest decline of mean deprivation between 1996 and 2007. Finally, mean deprivation for female-headed households in South Africa was also higher than for male-headed households over the period.

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LIST OF ABBREVIATIONS

AES	Adult equivalence scale
AMPS	All Media Products Survey
ASGISA	Accelerated and Shared Growth Initiative for South Africa
CBN	Cost of basic needs
CDF	Cumulative density function
COICOP	Classification of Individual Consumption According to Purpose
CS	Community Survey
FEI	Food energy intake
FGT	Foster-Greer-Thorbecke
GDP	Gross Domestic Product
GEAR	Growth, Employment and Redistribution
GIC	Growth incidence curve
HDI	Human Development Index
IES	Income and Expenditure Survey
LFS	Labour Force Survey
MCA	Multiple correspondence analysis
NIDS	National Income Dynamics Survey
OHS	October Household Survey
P_0	Headcount index
P_1	Poverty gap index
P_2	Squared poverty gap index
PCA	Principal components analysis
PSLSD	Project for Statistics on Living Standards and Development
QLFS	Quarterly Labour Force Survey
RDP	Reconstruction and Development Programme
SACMEQ	Southern Africa Consortium for Monitoring Educational Quality
SARB	South African Reserve Bank
SRMI	Sequential regression multiple imputation
Stats SA	Statistics South Africa
STC	Standard Trade Classification
UNDP	United Nations Development Programme

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CHAPTER ONE: INTRODUCTION

1.1 Statement of the problem

Since South Africa's transition to become a democratic society in 1994, eradicating poverty has always been one of the most important objectives of the government, in policies such as the Reconstruction and Development Programme (RDP), Growth, Employment and Redistribution (GEAR), Accelerated and Shared Growth Initiative of South Africa (ASGISA) and the recently launched New Growth Path. Numerous studies have been conducted to understand the extent and trends of poverty since the advent of democracy in South Africa in order to direct policy measures in the most effective way.

Most of these studies examined poverty using the conventional, money-metric approach, i.e. by using per capita income or per capita expenditure and by defining a poverty line, the money-metric poverty estimates and trends using various surveys can be derived. In other words, income or expenditure is used as a welfare indicator of poverty, thereby analysing poverty in a very uni-dimensional[1] way. However, when one considers the nature of poverty, it is evident that it is a multidimensional concept. Dimensions often associated with poverty generally pertain to having inadequate income, experiencing a sense of isolation, being vulnerable, having poor health, being educationally deprived and feeling a sense of powerlessness. Uni-dimensional poverty measures, however, fail to reflect these other aspects of deprivation.

The way in which poverty is defined will also dictate the method of measurement. The general idea of poverty is that it entails a state of deprivation. An individual is constantly in need, having less than the norm acceptable in society. Sen (1976:1) noted that one of the main problems when measuring poverty is identifying the poor. The identification problem is due to the relative nature of the concept "poor". To identify the poor, it is first necessary to determine what it means to be poor.

A further shortcoming of the money-metric approach relates to the reliability of income or expenditure data. For instance, Yu (2009:4) finds that a high proportion of households reported zero or unspecified income in censuses, but that excluding these households would

[1] The term uni-dimensional implies one-dimensional. For the remainder of this thesis, the term uni-dimensional will be used.

lead to a biased sample, thereby resulting in unreliable poverty estimates. In addition, some respondents might not provide accurate amounts because of, for example, illiteracy, privacy concerns or they simply do not remember how much they earned or spent during the recall period under consideration. Furthermore, there are often comparability issues with the datasets such as with the Income and Expenditures Surveys (IESs).[2] Crosoer, Leibbrandt and Woolard (2005: 1) also echo this sentiment on the inadequacies of traditional approaches in explaining chronic or persistent poverty. They state that this has led researchers to investigate quantifiable non-money-metric poverty estimates. Hence the data quality and comparability of the income and expenditure information captured by these censuses and household surveys have led researchers to express doubts about the validity of the poverty levels and trends derived by studies that adopted the money-metric approach.

Although most of the literature on poverty has focused on the money-metric approach, there have been few studies that use non-money-metric or multidimensional approaches. Given the policy focus on eradicating poverty, it is important to be able to adequately measure all dimensions of poverty and thereby ascertain the success of government's efforts. Multidimensional approaches do have certain shortcomings. As Van der Walt (2004:12) notes, there is no consensus on which dimensions to include in poverty analysis. This may lead to arbitrariness in deciding which dimensions should be included and in assigning weights. Certain studies investigate either only one non-money-metric variable at a time (e.g. Bhorat, Poswell and Naidoo, 2004), or composite indices such as the Human Development Index (HDI), which is a weighted average of three dimensions (Boltvinik, 2001: 19).

Where some multidimensional approaches such as HDI, as mentioned above, either assign equal weights to each variable, others may arbitrarily assign unequal weights to each variable. One way to deal with these problems is to use a multidimensional approach such as the fuzzy sets approach to poverty. Cheli and Lemmi's (1995) totally fuzzy and relative approach to poverty takes the concerns mentioned above into consideration. This study will use the Cheli and Lemmi (1995) approach to address the main research question, namely, what are the non-money-metric poverty trends in South Africa since transition as determined by using the fuzzy sets approach? The fuzzy sets method provides a better alternative, motivating its use in this thesis. Some methods may just assign weights arbitrarily to different dimensions, but the fuzzy sets approach does not do so. The determination of weights is based on the degree of deprivation within a dimension (Burger, Van der Berg, Van der Walt and Yu, 2004:4).

[2] The problems concerning comparability will be discussed in subsequent chapters.

Dimensions that are rare will have a higher weight. Furthermore, the approach addresses the issues of horizontal and vertical vagueness of poverty.

A further motivation for this study is that the government has invested a great deal in improving basic service delivery. An intervention for improving welfare is government's provision of a package of basic municipal services (Bhorat, Oosthuizen and Van der Westhuizen, 2012: 77). This means that households would not need to spend a huge proportion of their income on these basic services, which would in turn allow households to spend on other necessities. A particular activity does that require money is job searching. Provinces that are plagued by serious unemployment, such as the Eastern Cape and Limpopo province, may have many discouraged work-seekers. This may be due to the simple fact that they do not have the financial means to search for work. Thus the impact of basic service delivery could be that money would be freed up, allowing many discouraged work-seekers to look for work in other provinces. The provision of these services should improve living conditions and hence reduce non-income poverty.

In the light of the above reasons, the focus of this study is to create a deprivation index to measure poverty in a multidimensional non-money-metric way. This study uses all the South African Census and Community Survey 2007 data since the transition to investigate the non-money-metric poverty trends using the fuzzy sets approach. These results would then be compared with those derived from the traditional money-metric approach. It will thus become evident whether or not there is a difference in findings on poverty trends in South Africa and to what extent policy measures on poverty reduction have been successful.

1.2 Objectives of the study

A few studies have used the fuzzy set approach, such as Ngwane, Yadavalli and Steffens (2001), Qizilbash (2002), Burger *et al.* (2004) and Van der Walt (2004). These studies have either focused on 1995 OHS data as in the case of Ngwane *et al.* (2001), Census 1996 data in Qizilbash (2002) and Van der Walt (2004), while Burger *et al.* (2004) compared Census 1996 and 2001 data. By including the Community Survey 2007 (CS 2007) it is possible to derive

poverty trends of a longer duration. Hence, using South African Census data for 1996, 2001 and the Community Survey in 2007, the study aims to answer the following questions:[3]

- What are the non-money-metric poverty levels and trends in South Africa since the transition, using the fuzzy sets approach?
- Who are more likely to be poor? In other words, does poverty have strong race, gender and provincial dimensions, using this approach?
- Have the government's policy measures to reduce non-income poverty through basic service delivery proved to be successful? That is, has poverty declined in terms of non-money-metric measures?
- Who are the individuals who enjoyed more rapid improvements in basic service delivery over the period?
- Does the non-money-metric fuzzy sets approach identify a different group of poor, compared with the money-metric approach, which uses the per capita income variable?

1.3 Research methodology and outline of the study

The focus of this study is to create a deprivation index to measure poverty by using a non-money-metric approach. Using a multidimensional approach such as fuzzy sets will reflect the various dimensions of poverty. These would include dimensions such as education, household assets, facilities and access to services. Thus individual and household living conditions are examined.

Instead of making a distinct separation between poor and non-poor, the fuzzy sets approach allows individuals to partially belong to a group if they fall between minimum and maximum levels. Thus this study will use the totally fuzzy and the relative approaches as pioneered by Cheli and Lemmi (1995). This method addresses the problems of horizontal and vertical vagueness of poverty. It also entails allocating different weights to each variable. These are the dimension weights, which are the horizontal weights, while the vertical weights are the assigned values of each category within the dimensions.

[3] The non-money-metric poverty trends would have a longer time dimension had Census 2011 data been available; however, this census took place only in October 2011 and the data were not available at the time of writing.

The remainder of the thesis is structured as follows. Chapter Two examines concepts and measurements of poverty. Specific focus will be placed on definitions of poverty, money-metric and non-metric approaches, as well as the uni-dimensional and multidimensional approaches to measure poverty. The merits and drawbacks of each approach will be discussed in detail. Chapter Three provides a review of the literature on poverty trends since the transition using money-metric approaches, but more importantly on poverty trends using the non-money-metric approaches.

Chapter Four discusses the fuzzy sets approach, its methodology, the derivation of horizontal and vertical weights as well as the deprivation indices. Chapter Five presents the results of the empirical analyses, using the Census 1996, Census 2001 and CS 2007 data, focusing particularly on the levels and trends of deprivation during the period under study. Econometric analyses will be conducted to investigate who are more likely to be deprived. The results of the fuzzy sets analysis will then be compared with the findings using per capita income in these three surveys. Chapter Six reviews the findings and concludes the study.

CHAPTER TWO: CONCEPTS, DIMENSIONS AND MEASUREMENT OF POVERTY

2.1 Introduction

The main objective of Chapter Two is to examine concepts of poverty as well as its dimensions and measurement. Section 2.2 begins by reviewing the definitions of poverty, while Section 2.3 deals with different dimensions of poverty, focusing particularly on the difference between the uni-dimensional and multidimensional nature of poverty, as well as money-metric and non-money-metric dimensions. This is followed by Section 2.4, which discusses various methods of measuring poverty. Section 2.5 discusses various advantages and disadvantages of the different measurement approaches, with a specific focus on those of the multidimensional, non-money-metric approach to be adopted in this study. Section 2.6 summarises the chapter.

2.2 Reviewing poverty concepts

Poverty generally affects most people in some way or another. This may not occur directly but merely by encountering individuals whom we deem to be poor. There are many different definitions of poverty and they will differ from one community to the next, country to country. For instance, Woolard and Leibbrandt (1999:3) note that there is still debate on the meaning of poverty. For this purpose it is necessary to establish a general definition of poverty before measurement can take place. Thus addressing the conceptual issues of poverty will be the starting point.

> *To be poor is to be hungry, to lack shelter and clothing, to be sick and not cared for, to be illiterate and not schooled. But for poor people, living in poverty is more than this. Poor people are particularly vulnerable to adverse events outside their control. They are often treated badly by the institutions of state and society and excluded from voice and power in those institutions (World Bank, 2000:15)*

This short excerpt from the World Bank (2000) reflects the nature of poverty. It has multiple dimensions that describe a state of deprivation for an individual. An individual is thus unable to have what is considered the socially accepted minimum in terms of their living standards (Bhorat, Poswell and Naidoo, 2004:1). A more general definition of poverty provided by any

dictionary will offer words such as "indigence", "want" and "deficiency in" to describe the phenomenon.

The World Bank (2000:15) defines poverty as "pronounced deprivation in well-being". Haughton and Khandker (2009:2) rightly ask what the concept of wellbeing means. This is also necessary to know in order to have the reference point when measuring poverty. They outline the three main views of poverty as follows (Haughton and Khandker, 2009:2).

- Wellbeing is linked to the notion of being in control over commodities. Individuals who have a greater command over resources are considered to be in a better position regarding their wellbeing. In order for this to happen, they must have enough financial resources or consumption to place them above some defined threshold. If they are below this threshold, they are considered poor. Hence, poverty is viewed in monetary terms.
- The next approach to wellbeing is to ascertain whether individuals are able to obtain a specific type of good for consumption, such as food, shelter or education. This clearly goes beyond the above conventional monetary approach.
- The most comprehensive approach to wellbeing focuses on an individual's capability to function in society, as argued by Sen (1987). Individuals who are poor often lack key capabilities; for instance, they experience poor health, insufficient income, inadequate education, lack freedoms such as freedom of movement or speech, security and feel powerless. Thus the concept of wellbeing pertains to the overall condition of an individual. Govender, Kanbaran, Patchett, Ruddle, Torr and Van Zyl (2006:6) echo this view by stating that poverty refers to various forms of deprivation such as income, basic needs and human capabilities. Poverty thus has many dimensions.

2.3 Dimensions of poverty

From the discussion in Section 2.2, it is evident that there are dichotomies in the concept of poverty. Govender *et al.* (2006: 6-9); Woolard and Leibbrandt (2006) and Ravillion (1992, 1998) discuss these dichotomies further, namely in terms of objective versus subjective, temporary versus chronic, and absolute versus relative. Firstly, when determining the extent and level of poverty, comparisons can be made objectively or subjectively. Objective comparisons are those which can be objectively identified such as economic, educational and biological deprivation through quantitative measures. Subjective comparisons, on the other

hand, include qualitative indicators such as experiences, social conditions, political and livelihood issues.

The World Bank (2000: 16-21) and Woolard and Leibbrandt (1999:3, citing Chambers, 1988) identify five dimensions of poverty. The first two dimensions are objective identifications and the last three are subjective dimensions.

- *Poverty proper:* Inadequate income or a general lack of assets to generate income.
- *Health and educational deprivation:* Poor physical wellbeing is evident as a result of under-nutrition, sickness and disability. Low enrolment rates in primary school may indicate that the population does not possess the necessary human capital.
- *Physical and social isolation:* This is often the result of peripheral location, insufficient access to goods and services, ignorance and illiteracy.
- *Vulnerability:* This refers to the risk of being exposed to crisis and possibly becoming poorer.
- *Powerlessness:* There is a lack of access to networks in various structures (e.g. social, cultural, economic and political).

Poverty also has a temporal dimension, since poverty is dynamic. In other words, a wealthy person may suffer a reversal of fortune and become poor; similarly a poor individual may come out of poverty at some time. Those who are temporarily poor may move between states of being poor and non-poor. In contrast, individuals and households considered chronically poor are observed to be so at successive observations (Govender *et al*., 2006:8).

Another important dichotomy in the understanding of the concept of poverty is absolute and relative poverty. Govender *et al.* (2006:9) state "absolute poverty is determined without reference to the relative wealth of peers". Todaro and Smith (2006:202) claim that the extent of absolute poverty can be defined as "the number of people who are unable to command sufficient resources to satisfy basic needs". Basic physical needs include food, shelter and clothing, and having sufficient resources implies a certain minimum income level. Thus absolute poverty is based on some basic requirement necessary to sustain life. This minimum level is normally based on some essential goods and nutritional needs. However, these minimum subsistence levels also vary as a result of physiological, social and economic differences (Todaro and Smith 2006:54). It thus stands to reason that the reasonable minimum level of wellbeing is determined by the standards of the society (Ravallion, 1992). With respect to relative poverty, a person is considered poor in comparison to the standards of

living for a particular society. Govender *et al*. (2006:9) note that this has meant that two interpretations of what is classified as 'relatively poor' have emerged. The poorest x% of the population is poor and this is normally set at 10% or 20% of the population. The more common interpretation is that individuals are deemed poor if their standard of living is below a certain percentage that of their contemporaries. By using the fuzzy sets approach, the poor can be distinguished by using a relative poverty line. This approach will be adopted in Chapter Five.

From the discussion above, it is evident that poverty is not only about lack of income or low expenditure (i.e. a money-metric dimension), but poverty has many other non-money-metric dimensions. Vulnerability, a lack of education, landlessness are problems at the core of poverty (World Bank, 1990:24). From these different dimensions arise different measurement approaches and hence measurement results. This has clear implications for strategies employed to alleviate poverty.

In addition, when looking at poverty in the broader sense than just monetary measures (i.e. going beyond a one-dimensional or uni-dimensional view of poverty), it becomes evident that poverty has many dimensions (i.e. it has a multidimensional nature). May (2000:5) notes the different dimensions of poverty in South Africa as "being alienated from your community, to be unable to sufficiently feed your family, to live in overcrowded conditions, use basic forms of energy, lack adequately paid and secure jobs and to have fragmented families".

Poverty also has numerous non-money-metric dimensions. These include household assets/facilities, education, health and nutrition, to name but a few. As Haughton and Khandker (2009:1-2) state, poverty may be linked to specific types of consumption. People may be house-poor in the sense that their living conditions are poor, or food-poor in the sense that their nutritional requirements are not met, or health-poor pertaining to perpetual ill health. Thus dimensions of poverty other than the conventional money-metric dimensions are reflected. Non-money-metric dimensions – such as calorie intake, education, household assets or facilities – can be determined directly by assessing malnutrition or literacy levels, for instance.

2.4 Methods of measurement

Analysis of poverty has become routine, in practice following a few basic steps. Woolard and Leibbrandt (1999:3) state that households and individuals are first ranked on the basis of a welfare indicator. Then a poverty line is selected. The construction of a poverty profile allows further examination of the poor.

2.4.1 Welfare indicator

Welfare indicators can be non-money-metric such as dwelling type, fuel source, sanitation and access to water, or they can be money-metric such as income or expenditure. Van der Walt (2004:7) notes that households or individuals defined as poor are those who fail to meet some critical level necessary to sustain the minimum standard of living. This is with respect to some indicator or dimension of poverty. The poverty line stands for this critical level.

With regard to the use of non-money-metric indicators, the commonly used indicators relate to the basic set of needs, such as access to clean water, housing, energy source used, nutrition, health and literacy, to name a few. Each welfare indicator is then analysed by itself, and the poor are defined as those who are deprived in this dimension.

In the second approach, a composite welfare index, which considers more than one non-money-metric variable at a time, is constructed by a statistical procedure. The index can then be used to rank the degree of deprivation. Weights are allocated to each variable. Each variable carries either equal or unequal weights, depending on the weighting approach. An example of a welfare index that allocates equal weights to each variable can be found in the second Southern Africa Consortium for Monitoring Educational Quality (SACMEQ II) study on Grade 6 pupil literacy and mathematics performance (Moloi and Strauss, 2005). Question 7 of the pupil questionnaire asked the pupil participants to declare if they have certain assets or facilities available at the place of residence,[4] and the answers from these questions were used to derive the socio-economic status (SES) index, which has a minimum score of 0 (if the answer is "no" to all questions) but a maximum score of 14 (if the answer is "yes" to all questions). Those with an SES index below 7 or at least 7 are defined as people with low SES status (i.e. poor) and high status (i.e. non-poor) respectively.

However, attaching equal weights to the variables might not be the best approach. For example, if 95% of the sample have access to electricity in their dwellings, but only 50% have

[4] There are 14 variables in total: daily newspaper, weekly or monthly magazine, TV set, radio, video cassette recorder, cassette player, telephone, refrigerator/freezer, car, motorcycle, bicycle, electricity, piped water and a table to write on.

a TV set, then it could be argued that the former variable should be given greater weight, because a very high proportion of people have access to electricity, so the remaining 5% who do not have access to electricity feel very inferior and the lack of access to electricity should clearly indicate these people are poor.

Various techniques could be used to derive a welfare index by giving unequal weights to each non-money-metric variable. For instance, the factor analysis is one way to construct a non-income-based measure of welfare, such as an asset index. This allows the application of appropriate weights for the household asset and service index (Bhorat, Naidoo and Van der Westhuizen, 2006:16). A similar approach is principal components analysis (PCA), which can be used to construct an asset index as a proxy for household wealth. Yu (2009:20) explains this technique as attaching the most weight to the asset variables that are most unequally distributed. Variables are analysed to extract linear combinations of variables that capture the most information. To capture different dimensions in the data, each principal component is uncorrelated with the others. The first principal component explains the most variation in the data and is frequently used in the construction of the index. Multiple correspondence analysis (MCA) is another possible technique, as adopted by Spaull (2011). Spaull (2011:7) argues that MCA is preferred over PCA for categorical variables.

It is also possible to include both money-metric and non-money-metric variables when deriving a welfare index. For example, the Human Development Index (HDI) of the United Nations Development Programme (UNDP) attempts to rank all countries on a scale of zero to one, one being the highest human development. The three indicators used to construct the index are longevity, knowledge and standard of living. The measure of longevity is life expectancy. Educational attainment of an individual is the measure of knowledge. Real GDP per capita is used as the measure for standard of living. Equal weighting is given to each indicator (Todaro and Smith, 2006:61).

All the discussions above relate to the so-called “direct approach”. An alternative to it is the indirect or income approach, which first measures the resources (which involve not only income, but entitlement or rights) that a household commands, before comparing the magnitude and composition of these resources with the resource requirement to meet the set of basic needs. The methodology is considered the poverty line in instances when resources are reduced to either expenditure or income. The welfare indicator is expressed as a quantity of money (i.e. money-metric variable like per capita income or per capita expenditure)

(Boltvinik, 2001). Two commonly used methods are to work out the cost of a minimum basket of goods and then use the required income or expenditure level as the poverty line, and to estimate the income or expenditure that allows an individual to obtain food to meet energy requirements for survival. Theses issues are discussed in Section 2.4.2.

2.4.2 Poverty line

The World Bank (2000:18) states that the poverty line is a key building block in developing measures of poverty. Poverty lines are well-defined standards of consumption and, if these are not reached by an individual, he or she is deemed poor (Ravillion, 1992:25). It is a critical cut-off in income or consumption. The cost of a minimum basket of goods is calculated and the required expenditure or income is used as a poverty line. A poverty line effectively divides the population into two groups on the basis of some measure. For example, if the income poverty line is R350 per month, an individual earning R349 is in poverty whereas another earning R351 is not. All individuals or households below the line are considered poor and those above the line are considered non-poor. Defining a poverty line provides a useful measure to determine the number of poor individuals as well as the depth and severity of poverty.

Poverty lines can be distinguished in either relative or absolute terms. The concept of absolute poverty is used to characterise a particular minimum level of income required to satisfy basic needs such as shelter, food and clothing necessary for survival (Todaro and Smith, 2006:54). Thus individuals are defined as poor if they lack the command over resources to meet some absolute needs (Woolard and Leibbrandt, 1999:9).

The difference between the two poverty lines is that absolute poverty lines do not change with the standard of living; however, a relative poverty line will move with the standards of living. The poor are then those individuals suffering relative deprivation. The importance for the distinction is the implications it has for poverty-reduction strategies.

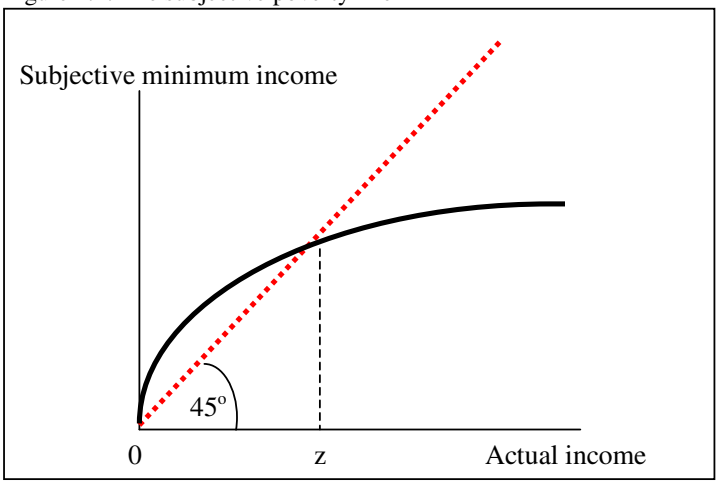
According to Govender *et al.* (2006:13), "an absolute poverty line is defined relative to the income/expenditure needed to attain a minimum standard of living", such as the income required for a basket of food for sufficient nutrition. The absolute poverty line is set with respect to the living standards indicator being used, as well as over the whole domain of the comparison (Ravillion, 1992:25). A South African example is the poverty lines (2000 prices, per capita per month) proposed by Woolard and Leibbrandt (2006: 21-22):

- Food poverty line (R211): this is the cost of purchasing sufficient food items to satisfy the daily food energy requirement of the average person over a month;
- Lower bound poverty line (R322): this indicates what is spent on food items (R211) and essential non-food items (R111);
- Upper bound poverty line (R593): this represents what is spent on food items (R211) and all non-food items (R382).

In contrast, relative poverty lines are defined with reference to others in the population. There are two methods to define a relative poverty line. According to Govender *et al.* (2006:13), a simple way to define a relative poverty line is the level of income/expenditure below which x% of the population is poor. This percentage is normally 40%. Woolard and Leibbrandt (1999:10) state that another method used to define poverty is in relation to existing living standards. The poverty line is thus set at a certain percentage of mean income or expenditure. Should the average income of a population increase, it could result in the raising of the line.

A distinction can also be made between subjective and objective poverty lines. A subjective poverty line reflects that poverty lines are naturally subjective judgments concerning what represents a minimum standard of living that is socially acceptable in a particular society (Ravallion, 1992: 33). The idea of basic needs varies from person to person and hence the individuals use different poverty lines. The approach is often based on survey responses and the minimal level of income tends to be an increasing function of actual income, as indicated by Figure 2.1. The point z is the subjective poverty line; individuals with income that is above z are more likely to be satisfied with their income, whereas those individuals with income below z may feel their income is insufficient.

Figure 2.1: The subjective poverty line



Source: Ravillion, 1992: 34.

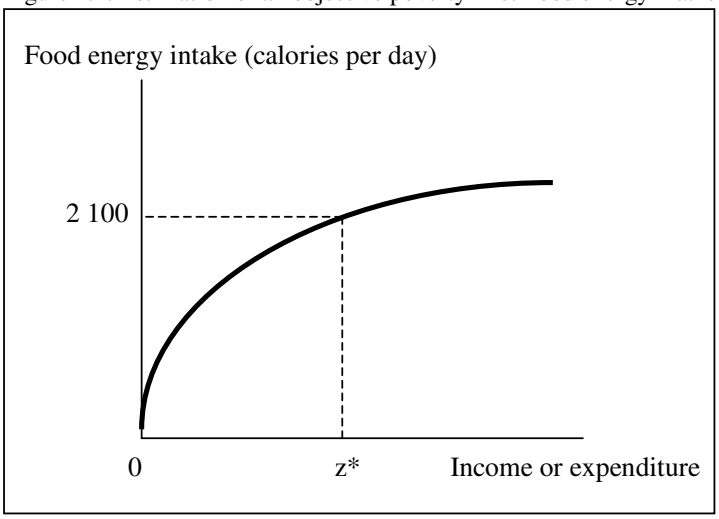
An objective poverty line is estimated by looking at the nutritional requirements for a healthy and active life (Ravallion, 1998: 8). Two approaches used for setting poverty lines are the cost of basic needs method and the food energy intake method. The food energy intake (FEI) method provides an alternative when data are limited. The cost of basic needs (CBN) method is made operational through the following steps as outlined by (Ravallion, 1992: 26-27; Woolard and Leibbrandt, 2006: 21; Haughton and Khandker, 2009: 49-50):

- A consumption bundle that comprises both food (z^F) and non-food components (z^{NF}) is stipulated. The nutritional requirement for good health per person per day is normally 2 100 calories;
- The prices of the items are collected;
- The cost of obtaining the food and non-food necessities are estimated forming the basis of the poverty line. The basic needs poverty line (z^{BN}) is given by $z^{BN} = z^F + z^{NF}$.

The approach does have certain shortcomings (Ravallion, 1992: 26-27; 1998: 17; Haughton and Khandker, 2009: 50). The approach does not lead to similar poverty lines in different countries, even though it may be expected to do so. Woolard and Leibbrandt (2006:21) note that the types of food the poor consume vary hugely across the world. This may even differ within a country, as prices or access to goods and services could differ. The number of calories required for good health may also vary from one person to the next as individuals have different metabolic rates, for instance. As national income rises, the non-food component of the poverty line budget also rises (Woolard and Leibbrandt, 2006:21). Price data might also not be available for all goods in the consumption bundle.

As mentioned previously, the FEI method is the alternative method of constructing the poverty line when price data are not available. The objective is also to determine the level of income or consumption expenditure that facilitates a household to acquire enough food to meet its essential requirements. According to Haughton and Khandker (2009: 54-55), it is first necessary to determine the amount of food that is sufficient to meet the energy requirements. A calorie income function is estimated. The curve can be used to determine the poverty line for some level of adequate energy intake. It is then possible to find the expenditure z* at which a person normally achieves the set food-energy required, for instance, 2 100 calories per day, as shown in Figure 2.2.

Figure 2.2: Estimation of an objective poverty line: Food energy intake method



Source: Ravallion (1998: 11).

The method is useful as it does not require price information and automatically includes both food and non-food items (Haughton and Khandker, 2009: 54). However, the approach does also have its shortcoming. As Ravallion (1992: 28) states, "the relationship between food energy intake and consumption or income is not going to be the same across regions/ sectors/ dates, but will shift according to differences in tastes, activity levels, relative prices, publicly provided goods or other variables". Hence this method is unlikely to generate poverty lines that are constant.

As discussed previously, the commonly used money-metric variable for measuring poverty is per capita income or expenditure, which is derived by dividing household income (or expenditure) by household size. However, strictly speaking, households differ not only in size but also by demographic composition, and hence the straightforward comparison of per capita income (or expenditure) might be deceptive (Woolard and Leibbrandt, 1999: 12). For instance, the cost of a child in terms of food expenditure required for survival is smaller than that of an adult. There are also equivalence scales that assign adult females an adult male equivalence less than one, as the consumption by adult females is often less than that of adult males for most goods (Ravallion, 1992: 17-18). For this reason it is argued that per adult equivalent income or expenditure should be used for measuring poverty. Woolard and Leibbrandt (1999:12) note that converting household consumption to consumption per 'equivalent adult male' has become more popular.

There is a wide range of adult equivalence scales (AES), with the simplest and most commonly used being the so-called 'double parameter class of scales' introduced by Cutler and Katz (1992), namely $E = (A + \alpha C)^{\theta}$, where:

E = number of adult equivalents in the household;

A = number of adults in the household;

C = number of children in the household;

α = a constant reflecting the resource cost of a child relative to an adult, with $0 \leq \alpha \leq 1$;

θ = the overall economies of scale within the household, with $0 \leq \theta \leq 1$

If α is equal to one, it means children are counted as adults. θ has the same range, and if it is smaller than one, economies of scale in consumption is taken into consideration (Woolard, 2001; Haughton and Khandker, 2009). In addition to the scale proposed by Cutler and Katz, there are other AESs, as shown in Table 2.1.

Table 2.1: Commonly used adult equivalence scales

Scale	Equation
Square root scale	$E = (A + C)^{0.5}$
OECD original	$E = 1 + 0.7(A - 1) + 0.5C$
OECD modified	$E = 1 + 0.5(A - 1) + 0.3C$
Double parameter class of scales	$E = (A + \alpha C)^{\theta}, \quad 0 < \alpha \leq 1, \quad 0 < \theta \leq 1$

Sources: Deaton and Paxton (1997); OECD (2008); Streak, Yu and Van der Berg (2009).

Some recent studies showed that different equivalence scales made a only slight difference to identifying the poor, and the poverty measures did not differ too much (although this does not necessarily mean that the same group of people is distinguished as poor at different scale parameters), regardless of whether per capita or per equivalent variables were used (e.g. May, Carter and Posel, 1995; Woolard and Leibbrandt, 1999; Woolard, 2001; Streak *et al*., 2009). For instance, Woolard and Leibbrandt (1999) applied various Cutler and Katz scales[5] on the IES 1995 data. Fixing the share of households in poverty at 40%, it was found that the poverty profile did not change very much. This was the case even when the adjustments made to the scale parameters were quite big. In particular, the poverty rate amongst blacks, coloureds as well as urban and rural dwellers remained unchanged. Streak *et al*. (2009) conducted a similar study on IES 2005/2006, but focusing on child[6] poverty, and found that the magnitude and composition of child poverty was not sensitive to the scale used.

[5] The following scales were used: (1) α = 0.5, θ = 0.6; (2) α = 0.5, θ = 0.75; (3) α = 0.75, θ = 0.6; (4) α = 0.75, θ = 0.75; (5) α = 0.75, θ = 0.9; (6) α = 1, θ = 0.6; (7) α = 1, θ = 0.75; (8) α = 1, θ = 0.9.

[6] Children were defined as those aged 0-17 years in their study.

2.4.3 Summary statistics

Following the work by Sen (1976) regarding poverty measurement, a number of axioms have been developed to provide consensus on the basic requirements of a good poverty measure. Van der Walt (2004:10, citing Hagenaars, 1991) summarised a number of axioms.

- *Symmetry Axiom*: Poverty should not be affected if the same distribution of income is found with different individuals.
- *Monotonicity Axiom*: If the income of an individual who is below the poverty line falls, then the poverty index must increase.
- *Transfer Axiom*: If a person below the poverty line transfers his/her income to someone richer than himself/herself, then the index must increase.
- *Population Symmetry Axiom*: Pooling two or more exact populations should not cause the index to change.
- *Focus Axiom:* The poverty index should not change as a result of an adjustment of the non-poor income distribution.
- *Transfer Sensitivity Axiom:* A transfer of a fixed amount of money from an individual who is poor to another who is richer results in the poverty index increasing. As a result the income of the donor should decrease and the opposite is true for the individual receiving income.
- *Subgroup Monotonicity Axiom:* Should poverty in a subgroup increase, then the poverty index should also increase.
- *Decomposability Axiom:* The poverty index should also be a weighted average of the poverty indices, applied to particular subgroups, within a population.

Once the poverty line has been determined, the way to assess the extent of poverty must be decided. The most commonly used measures are those proposed by Foster, Greer and Thorbecke (1984). The poverty indices are expressed as follows:

$$P_\alpha = \frac{1}{n}\sum_{i=1}^{q}\left(\frac{z - y_i}{z}\right)^\alpha \Big| (y_i \le z)$$

Where

P_α = measure of poverty;

q = number of poor people;

n = total number of people;

z = poverty line;

y_i = income of the i-th person.

Three main measures, which are all part of the class of measures suggested by Foster, Greer and Thorbecke (i.e. FGT indices), are the headcount index (P_0 or H), the poverty gap index (P_1 or PG), and squared poverty gap index (P_2) (Ravillion, 1992:35). The measurement of absolute poverty can be undertaken by the headcount of those whose incomes fall below the poverty line. The headcount index is the share of the population that is considered poor (Woolard and Leibbrandt, 1999:20). It reflects the incidence of poverty. The poverty gap index measures the mean distance that a poor individual is from the poverty line, thus reflecting the depth of poverty, or it can be viewed as the income deficit of the poor from the poverty line (Ravillion, 1992:36). The severity of poverty is given by the P_2 measure. Ravillion (1992:38) states that "the poverty gaps of the poor are weighted by those poverty gaps in assessing aggregate poverty".

The headcount index (P_0) is easy to interpret reflecting the incidence of poverty; however, a criticism of this measure is that it does not consider the degree of the deficit of the poor's income with respect to the poverty line (World Bank, 2000:18). The monotonicity axiom is not met, as individuals below the poverty line may become poorer; however, the index does not change in response to fall. The headcount index also fails to capture the severity of poverty and the transfer axiom is not met. A transfer in income from a poor individual to a person who is less poor does not have the resultant effect of increasing the index (Govender *et al*., 2006: 15-16). The poverty headcount index does meet the population symmetry and proportion of the poor axioms.

The poverty gap index (P_1) meets the monotonicity axiom. As the incomes of individuals decrease, the poverty gap increases, reflecting the depth of poverty. Pooling two or more identical populations does not result in any change of the index and thus the population symmetry axiom is also met. The index, however, fails to meet the transfer axiom. It is insensitive to the extent of inequality among the poor (World Bank, 1990). Furthermore, it does not qualify the proportion of the poor axiom. Thus a decrease in the share of those determined as poor will not result in the index decreasing.

The squared poverty gap index (P_2) is a measure of the severity of poverty. It takes both poverty and inequality among the poor into consideration. It is useful for comparing policies that aim to reach the poor and also meets the transfer axiom; however, Ravillion (1992) states

that a major criticism is the difficulty in interpretation. Other indices may prove better in adhering to the axioms, but are hard to interpret.

Table 2.2 provides numerical examples of the derivation of the above indices of a hypothetical country between 2008 and 2010, and it can be seen that, using P_0, one would reach a conclusion that poverty was very stable during the three years under study, but after interpreting P_1 and P_2, it is found that poverty was more severe in 2010.

Table 2.2: Poverty headcount ratios, poverty gap indices and squared poverty gap indices of a hypothetical country, 2008-2010

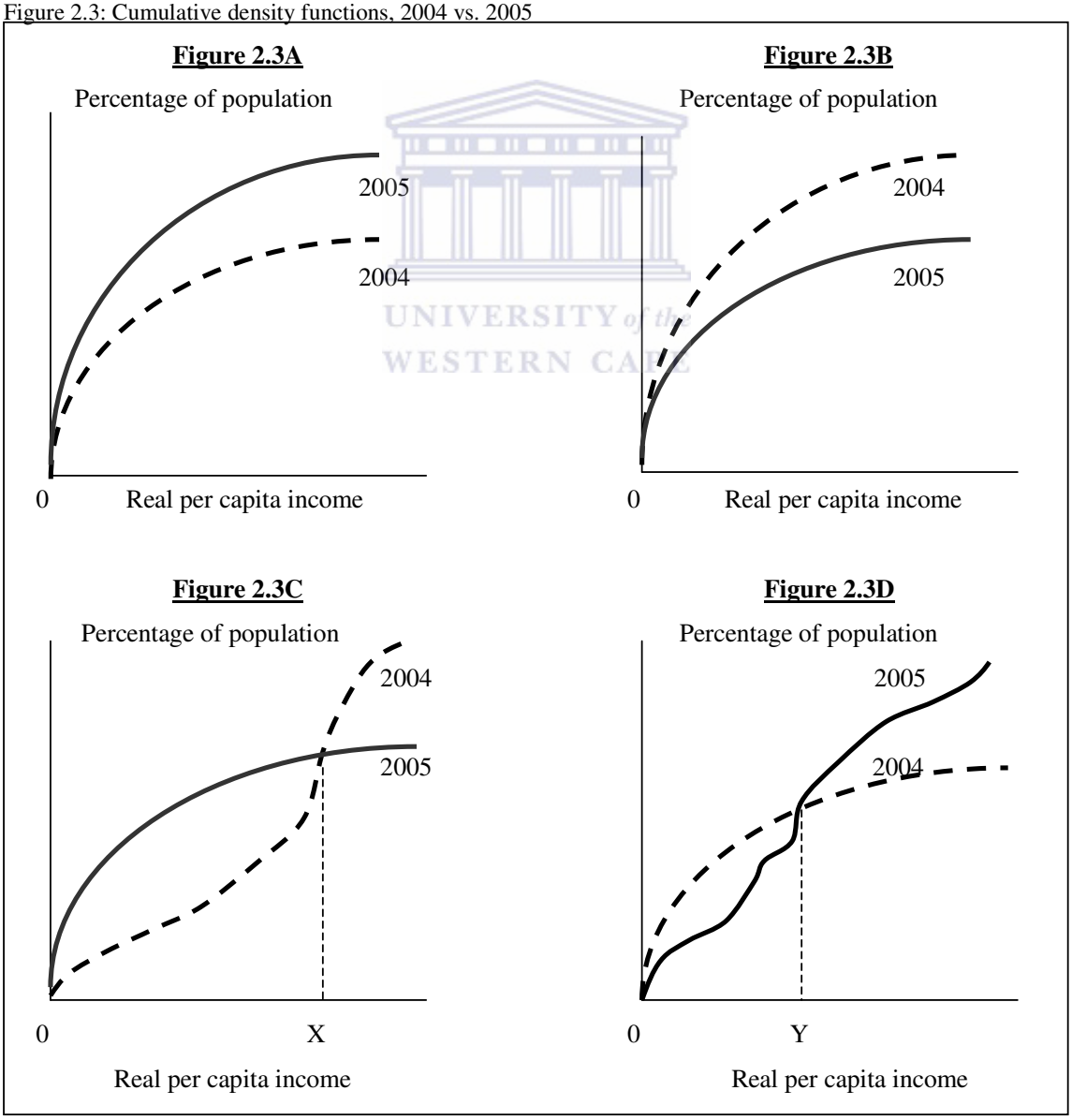
	Poverty line: R3 000				
	Income for each individual in the country (Rand)				
n = 5	**Person A**	**Person B**	**Person C**	**Person D**	**Person E**
2008	5 000	5 000	2 500	2 500	2 500
	Non-poor	Non-poor	Poor	Poor	Poor
	$P_0 = \frac{3}{5} = 0.6$ $P_1 = \frac{1}{5}\left[0+0+\left(\frac{3000-2500}{3000}\right)+\left(\frac{3000-2500}{3000}\right)+\left(\frac{3000-2500}{3000}\right)\right] = \frac{1}{5}\left[\frac{1500}{3000}\right] = 0.10$ $P_2 = \frac{1}{5}\left[0+0+\left(\frac{3000-2500}{3000}\right)^2+\left(\frac{3000-2500}{3000}\right)^2+\left(\frac{3000-2500}{3000}\right)^2\right] = 0.0167$				
2009	5 000	5 000	2 000	2 000	1 000
	Non-poor	Non-poor	Poor	Poor	Poor
	$P_0 = \frac{3}{5} = 0.6$ $P_1 = \frac{1}{5}\left[0+0+\left(\frac{3000-2000}{3000}\right)+\left(\frac{3000-2000}{3000}\right)+\left(\frac{3000-1000}{3000}\right)\right] = \frac{1}{5}\left[\frac{4000}{3000}\right] = 0.27$ $P_2 = \frac{1}{5}\left[0+0+\left(\frac{3000-2000}{3000}\right)^2+\left(\frac{3000-2000}{3000}\right)^2+\left(\frac{3000-1000}{3000}\right)^2\right] = 0.1333$				
2010	5 000	5 000	2 250	2 250	500
	Non-poor	Non-poor	Poor	Poor	Poor
	$P_0 = \frac{3}{5} = 0.6$ $P_1 = \frac{1}{5}\left[0+0+\left(\frac{3000-2250}{3000}\right)+\left(\frac{3000-2250}{3000}\right)+\left(\frac{3000-500}{3000}\right)\right] = \frac{1}{5}\left[\frac{4000}{3000}\right] = 0.27$ $P_2 = \frac{1}{5}\left[0+0+\left(\frac{3000-2250}{3000}\right)^2+\left(\frac{3000-2250}{3000}\right)^2+\left(\frac{3000-500}{3000}\right)^2\right] = 0.1639$				

Another commonly used method to measure poverty is cumulative density functions (CDFs) for dominance testing. If one were to plot H (P_0 measure) on the vertical axis and the poverty line on the horizontal axis, this would simply be the cumulative distribution function (CDF) thought of as the poverty incidence curve (Ravillion, 1992:57). In a CDF the vertical axis

shows the percentage of total population with an income that is less than, or equal to, the income value on the horizontal axis.

According to Ravillion (1992:65), dominance testing is useful for determining whether poverty has increased over time. One can compare changes in poverty from one period to the next independent of any single poverty line. Figure 2.3 illustrates the usefulness of this method. In Figure 2.3A the CDF for the period 2005 lies above the CDF for the previous period (2004) on the horizontal axis. This implies that poverty has increased, irrespective of any given poverty line. The cumulative percentage of the population with a certain income or less has increased. Figure 2.3B indicates that the converse is true and poverty has decreased at all poverty lines.

Figure 2.3: Cumulative density functions, 2004 vs. 2005



Figures 2.3C and 2.3D reflect interacting poverty incidence curves. The CDFs cross each other at a particular income level. Thus the comparison of poverty estimates between 2004 and 2005 is responsive to the poverty line chosen. In Figure 2.3C, poverty was lower in 2004 for any income level below X. However at any income level more than X, poverty was lower in 2005, as the CDF for 2005 is below the CDF for 2004. The same reasoning can be applied to Figure 2.3D.

2.5 A multidimensional, non-money-metric approach to measure poverty

The advantages of the traditional money-metric approaches are their simplicity and ease of interpretation and hence they are used more often. However, they have many shortcomings. Traditional approaches have the distinct feature of being uni-dimensional, but when one considers the nature of poverty, it is evident that it is a multidimensional concept. Thus, uni-dimensional poverty measures fail to reflect other aspects of deprivation. Per capita expenditures and income are good standards for comparing the standard of living; however, neither captures dimensions of welfare such as literacy, life expectancy and health, for instance (World Bank, 1990:26). Bhorat *et al*. (2004:2) note the usefulness of the income poverty approach, but also that it excludes the services available to, as well as assets owned by, individuals. These are additional descriptors of poverty in society.

Van der Walt (2004:11) notes that the clear distinction that the use of poverty lines makes between poor and non-poor is another shortcoming of the uni-dimensional approach. With respect to the use of poverty lines, it clearly separates poor from non-poor. However, one would expect that for a concept such as poverty, if individuals lie between the minimum and maximum levels, they could partially belong to either. Another shortcoming of the traditional, uni-dimensional, money-metric method is the independence a researcher has in having to decide on a poverty line or which dimensions to consider. Since poverty lines may differ in studies, this leads to variance in poverty estimates. Income and/or expenditure categories may also differ across surveys, which could also lead to differing poverty estimates.

A further shortcoming arises as a result of the unreliability of income or expenditure data. For instance, Yu (2009:4) finds that a high proportion of households reported zero or unspecified income in censuses and excluding these households in poverty analyses would lead to biased results. The proportion of households that reported zero income is 13.0% in Census 1996,

21.0% in Census 2001 (before hot deck imputation was conducted by Stats SA), and 8.2% in CS 2007. The proportion of households with unspecified income is 11.5% in Census 1996, 16.4% in Census 2001 (once again, before hot deck imputation was conducted by Stats SA), and 11.1% in CS 2007. The impact of including these households would result in an over-estimation of poverty estimates. The IESs also strangely captured much lower income and expenditure data in 2000 compared with the amounts captured in 1995. Such a decrease in income between 1995 and 2000 was greater than occurred during Great Depression, hence using the money-metric income or expenditure dimensions would almost certainly give the result that poverty worsened seriously between 1995 and 2000 (Van der Berg, Louw and Du Toit, 2008). Some respondents might also not provide accurate amounts for reasons such as illiteracy, privacy concerns or they simply do not remember how much they earned or spent during the recall period under consideration. Survey designs may also vary over time, thus making comparisons more difficult (World Bank, 2000:16).

Approaches that consider non-money-metric variables also have their advantages and disadvantages. When analysing dimensions separately (e.g. one non-money-metric variable at a time such as dwelling type or energy source), a shortcoming of the approach is that it takes only one indicator into consideration at a time and fails to estimate trade-offs among the dimensions (World Bank, 1990). For example, assume person A stays in a formal dwelling but does not have access to electricity as fuel source for cooking, person B has electricity but resides in an informal dwelling, and person C does not have electricity and resides in an informal dwelling. If dwelling type is used as the welfare indicator, and residing in a formal dwelling is the minimum acceptable standard of the indicator, persons B and C are defined as poor. In contrast, if fuel source for cooking is the welfare indicator, and having access to electricity is the minimum acceptable standard, persons A and C are identified as poor. From the results above, it is obvious that C is the poorest of the three, but it is difficult to determine whether person A or person B is poorer.

Multidimensional approaches have the advantage of addressing the multidimensional nature of poverty. By including other dimensions of poverty when measuring an individual's wellbeing, the horizontal vagueness of poverty is addressed. They also do have certain shortcomings. Measuring deprivation in the dimensions of education and health is also not an easy task. This is because of data problems on non-income indicators (World Bank, 2000:18). Many studies have limited their definition of poverty to dimensions that are easily measurable. Defining poverty in a broader sense can make measurement cumbersome. As

Van der Walt (2004:12) notes, there is no consensus on which dimensions to include in poverty analysis. This may lead to arbitrariness when deciding which dimensions should be included. Certain studies either only investigate one non-money-metric variable at a time (e.g. Bhorat, Poswell and Naidoo, 2004), or in the case of composite indices such as the Human Development Index (HDI), is a weighted average of three dimensions (Boltvinik, 2001: 19). Some multidimensional approaches such as HDI either assign equal weights to each variable; others may arbitrarily assign weights to each variable. There is some debate around the derivation of weights in these approaches. The key issue is that certain dimensions add more to poverty. Hence attaching equal weights (e.g. as in HDI) may not be the best. Thus it may be better to use a method that attaches unequal weights.

The various measurement methods mentioned have their merits; however, numerous shortcomings have been highlighted. The fuzzy sets approach is another alternative. It addresses the multidimensional nature of poverty. The index can be created to measure poverty in a non-money-metric manner, including non-money-metric dimensions such as education, household assets, facilities and access to services. It could also include the money-metric income variable in addition to numerous non-money-metric household characteristics, as Burger, Van der Berg, Van der Walt and Yu (2004) did.

However, as mentioned before, some surveys have a huge proportion of households with zero or unspecified income (e.g. the censuses), or income or expenditure data across the surveys are incomparable (e.g. IESs). Hence, including the income variable in the multidimensional index of the analysis requires that these households with zero or unspecified income be dropped. The implication of dropping too many observations is that the results of studies would be biased and unreliable. Furthermore, weights are not assigned arbitrarily to dimensions. The determination of weights is based on the degree of deprivation within a dimension (Burger *et al*., 2004:4). Dimensions that are rare will have a higher weight. Therefore, the fuzzy sets approach is an alternative to measure poverty and will be adopted in this thesis. This particular method will be discussed in greater detail in Chapter Four.

2.6 Conclusion

Chapter Two reviewed concepts, dimensions and measurements of poverty. The chapter began by defining poverty and discussing the dimensions of poverty before looking at the money-metric and non-money-metric indicators, which could be used in measuring poverty.

Various approaches to define the poverty line were reviewed. After that the three FGT indices were discussed as well as cumulative density functions for dominance testing. Furthermore, various advantages and disadvantages of the different measurement approaches were discussed, and it was concluded that the non-money-metric, multidimensional approach is relatively preferable.

CHAPTER THREE: LITERATURE REVIEW OF POVERTY TRENDS SINCE THE TRANSITION

3.1 Introduction

The purpose of Chapter Three is to review the findings of literature on South African poverty trends since the transition using money-metric and non-money-metric approaches. Section 3.2 starts by discussing the results of studies using the money-metric-approach (e.g. using variables like per capita income or expenditure). Section 3.3 examines the studies using non-money-metric approaches (e.g. using an asset index). This is followed by Section 3.4, which looks at results of studies that consider both money-metric and non-money-metric variables (e.g. the Human Development Index). Section 3.5 concludes the chapter.

3.2 Literature review of studies on poverty trends using money-metric approaches

There is a vast literature on the level, depth, severity and trends of poverty in South Africa. Most of these studies focus on the traditional money-metric approach, i.e. using per capita income or per capita expenditure, and by defining a poverty line, the income poverty estimates and trends using various surveys since 1993 were derived. The commonly used datasets for these analyses are the Project for Statistics on Living Standards and Development (PSLSD)[7], Income and Expenditure Surveys (IESs)[8], Census 1996 and 2001[9], Community Survey 2007 (CS 2007)[10], All Media Products Surveys (AMPSs), and National Income Dynamic Study (NIDS).[11]

3.2.1 Studies that have used IES data

Hoogeveen and Ozler (2006) investigated poverty and inequality using the IES 1995 and IES 2000 per capita expenditure data. The Standard Trade Classification (STC)[12] approach was adopted to categorise the income and expenditure items. The international US$2 per day (equivalent to R174 per month, 2000 prices) poverty line and the cost of basic needs poverty

[7] This survey took place only once in 1993 and never again.
[8] Since the advent of democracy, the IES took place in the years 1995, 2000, 2005/2006 and 2010/2011, but the data of the latter survey had not been released yet at the time of writing.
[9] These two censuses are, strictly speaking, not surveys. However, for the remainder of the thesis they will be referred to as surveys.
[10] As the cabinet decided not to conduct a census in 2006, an information gap between Census 2001 and Census 2011 was created. Hence, a decision was made to conduct the 2007 Community Survey (CS 2007).
[11] Two waves of NIDS took place at the time of writing, in 2008 and 2010/2011.
[12] For additional information on the STC approach, refer to Yu (2008).

line of R322 per month (2000 prices) were used to investigate poverty. The poverty headcount ratio increased from 0.32 to 0.34 for the R174 poverty line, but remained unchanged at 0.58 for the R322 poverty line.

Van der Berg and Louw (2004) also compared IES 1995 with IES 2000. The mean incomes by race were calculated using national accounts data as well as other data sources. The income values were then applied to the intra-group distributions of income in the IESs. This was done as a result of their concern about the inconsistent household income trends in the national accounts and IESs over the period. In the national accounts household income rose, whereas in the IESs there was a decline in household income over the period, to the extent that the decline was even greater than occurred during the Great Depression.[13] The poverty line used was R250 per month (2000 prices). The poverty headcount ratio declined slightly over the period from 0.39 in 1995 to 0.38 in 2000. As a result of population growth, the number of people living in poverty has increased.

Pauw and Mncube (2007) also raised concerns about the sharp contrast in the national accounts income data by the South African Reserve Bank (SARB)[14] and IES 1995 and 2000 income data. The adjusted versions of IES 1995 and 2000 datasets provide the basis for the calculations of changes in poverty by shifting the IES income distribution rightwards in line with the national accounts income mean. Corrections were made to any accounting or reporting discrepancies. Using the abovementioned adjusted per capita expenditure variable and the poverty lines of US$1 a day, US$2 a day and R322 per month (2000 prices), it was found that the poverty headcount ratio increased in all the poverty lines between the two surveys. For the US$1 a day poverty line, an increase in the poverty headcount ratio occurred from 0.05 in 1995 to 0.11 in 2000; the US$2 a day poverty line, the poverty headcount ratio changed from 0.22 in 1995 to 0.31 in 2000; and for the R322 per month (2000 prices) poverty line, an increase in the poverty headcount ratio occurred from 0.22 in 1995 to 0.31 in 2000.

Yu (2008) attempted to use all three IESs to look at poverty and inequality trends. Since a new COICOP[15] method was used in 2005 to categorise the income and expenditure items, the income and expenditure variables were not derived in exactly the same way as in the previous IESs (using the STC approach). Hence the income and expenditure variables are not fully

[13] Two years after IES 2000 was released, Stats SA admitted that IES 1995 and IES 2000 data are not comparable.
[14] The SARB derives national accounts income data and releases the information in the Quarterly Bulletin of the Reserve Bank.
[15] COICOP stands for the Classification of Individual Consumption According to Purpose.

comparable. As the COICOP method is quite different from the STC method, it was necessary to either re-categorise income and expenditure items in 1995 and 2000 using the 2005 COICOP structure or re-categorise the income and expenditure items in 2005 using the STC approach for meaningful comparative analysis across all three surveys. Using a poverty line of R322 per month (2000 prices) and per capita income variables derived by the STC approach, the poverty headcount ratio increased from 0.44 to 0.56 between IES 1995 and IES 2000, before declining to below 0.50 in IES 2005/2006. When using the per capita income variable derived by COICOP approach, similar results are obtained.

The results must be interpreted with caution, however, as there are comparability issues. Yu (2008:3) states that the IES 2005/2006 differs from the IESs in 1995 and 2000 in many ways. The first issue is the aforementioned STC and COCIOP categorisation approaches. According to Yu (2008:11), "COICOP is a reference classification published by the United Nations Statistics Division that divides the purpose of individual consumption expenditures incurred by three institutional sectors, namely households, non-profit institutions serving households and general government, and was adopted for the first time in South Africa in IES 2005/2006". For the IES2005/2006, households were included in the sample; however, non-profit institutions that served households as well as general government were not included.

Secondly, the IESs in 1995 and 2000 used only the recall method to capture income and expenditure on non-durable items, semi-durable items and durable items and services. However, in 2005/2006 another method, the diary approach, was also used in addition to the recall method. The diary method was used to capture expenditure on non-durable items, semi-durable items and durable items. The recall method was used to capture income and expenditure on semi-durable items and durable items and services. The third issue is changes in sampling design, questionnaire structure, the number of visits to the household, etc. Thus the 2005/2006 IES is different in these respects to previous IESs.

The article by Streak *et al*. (2009) showed that when choosing an equivalence scale, only a slight difference in identifying the poor occurs. The study focused on child poverty using IES 2005/2006 data. When the poverty line was set at the 40th percentile of households calculated with different AESs, child poverty was found to be fairly insensitive to the scale used. The rankings of children are unaffected by the choice of AESs. For the construction of the child poverty profile, per capita income is used as the welfare indicator with the poverty line set at the 40th percentile of household. This amounts to R4 650 per annum per capita in 2000

prices. It was found that child poverty is more extensive than poverty for the entire population.

Finally, Bhorat and Van der Westhuizen (2008) used the per capita household expenditure variable to investigate the critical interactions between economic growth, poverty and inequality between IES 1995 and IES 2005. The 1995 items were re-categorised using the COICOP approach. Two poverty lines were used, namely R174 and R322 per capita per month (2000 prices). They found that poverty headcount ratios declined between 1995 and 2005 for both poverty lines. For the R174 per month (2000 prices) poverty line, the poverty headcount ratio decreased from 0.31 in 1995 to 0.23 in 2005, and for the R322 per month (2000 prices) poverty line, the poverty headcount ratio decreased from 0.53 in 1995 to 0.48 in 2005.

3.2.2 Studies that used Census and the CS 2007 data

Leibbrandt, Poswell, Naidoo and Welch (2006) compared Census 1996 with Census 2001 to analyse poverty. The incomes of children below the age of 15 years with positive personal incomes were reset as zero in both censuses. Households with zero or unspecified household income were also excluded, before per capita income was derived. The poverty lines used were R250 per month (1996 prices) and US$2 per day. It was found that the poverty headcount ratio increased across the two censuses from 0.50 to 0.55 for the R250 per month poverty line, and from 0.26 to 0.28 for the US$2 per day poverty line. After including households with zero income for the analyses, it was found that the poverty headcount ratio increased from 0.59 to 0.65 between the two censuses using the R250 per month poverty line and from 0.40 to 0.44 using the US$2 per day poverty line.

In the study by Yu (2009), his analyses show that the household income variable originally derived by Stats SA in Census 1996 is incorrect.[16] In addition, in both Census 1996 and 2001 as well as in CS 2007, there is a high proportion of households with zero or unspecified incomes. Instead of simply accepting and including the zero-income households as well as dropping the households with unspecified income from the analyses, Yu (2009) imputed the income of these households by means of sequential regression multiple imputation[17] (SRMI) at both the person and household levels (i.e. SRMI1 and SRMI2 respectively). The three

[16] See Yu (2009: 11-13, 27) for a detailed explanation of the incorrect income variable derived by Stats SA for Census 1996.
[17] See Raghunathan *et al*. (2001), Ardington *et al*. (2005) and Lacerda *et al*. (2008) for detailed explanations of the SRMI method.

poverty lines as proposed by Woolard and Leibbrandt (2006) were used[18]. The results of the study indicate that irrespective of which post-SRMI variable was used, the poverty headcount ratio increased between the two censuses. A decrease then took place in the CS 2007. However, after the imputations were conducted, the levels of poverty came down.

It was found that for the SRMI1 variable, the poverty headcount ratio increased across the two censuses from 0.49 to 0.55 and then decreased in the CS2007 to 0.35 for the R211 (2000 prices) per month poverty line. For the R322 per month (2000 prices) poverty line, an increase in the poverty headcount ratio occurred from 0.60 in 1995 to 0.65 in 2000 and then decreased to 0.48 in 2007. Finally, for the R593 per month (2000 prices) poverty line, the poverty headcount ratio increased across the two censuses from 0.73 to 0.77 and then decreased in 2007 to 0.66. With respect to the SRMI2 variable, the poverty headcount ratio also increased across the two censuses from 0.44 to 0.45 and then decreased in the CS2007 to 0.33 for the R211 (2000 prices) per month poverty line. For the R322 per month (2000 prices) poverty line, the poverty headcount ratio increased from 0.58 in 1995 to 0.59 in 2000 and then decreased to 0.46 in 2007. Finally for the R593 per month (2000 prices) poverty line, the poverty headcount ratio increased across the two censuses from 0.72 to 0.75 and then decreased in 2007 to 0.65.

3.2.3 Studies that have used AMPS data

Van der Berg, Louw and Yu (2008) used the 1993-2004 AMPS data. A poverty line of R250 per month (2000 prices) was chosen. The results indicate that the poverty headcount ratio increased continuously in 1993-1996. This was followed by a period of stability until 2000, before a decline after 2001. In the study by Van der Berg, Louw and Du Toit (2008) the 2005 and 2006 AMPS data were added to the 1993-2004 data. A poverty line of R250 per month (2000 prices) was also chosen. The findings of the two studies were similar, with the headcount ratio declining from 0.50 in 1993 to 0.44 in 2006.

AMPS data were also used in the study by Van der Berg, Burger, Burger, Louw and Yu (2005, 2009). To conduct the income distribution analysis the data for intra-group distributions of income were combined with data for inter-group distributions of income. In the 2005 study the 1993-2004 AMPS data were used and a poverty line of R250 per month (2000 prices). Results indicate that the poverty headcount ratio increased between 1993 and

[18] Refer to Section 2.4.2 in Chapter Two for these three poverty lines as proposed by Woolard and Leibbrandt (2006).

2000. A downward trend occurred after 2000. The study conducted by Van der Berg, Burger, Burger, Louw and Yu (2009) used the same poverty line of R250 per month (2000 prices) as well as the same data. However, there were improvements in the methods to estimate the distribution of wage income. The poverty headcount ratio similarly showed an increase between 1993 and 2000. A downward trend occurred between 2000 and 2004.

3.2.4 Studies that have used various survey data

Simkins (2004) investigated poverty and inequality trends using IES 1995 and 2000 data together with Census 1996 and 2001 data. The poverty line used was in line with a household income of R800 per month (2000 prices). The poverty headcount increased between the censuses as well as the IESs.

Leibbrandt, Woolard, Finn and Argent (2010) used the 1993 PSLSD, 2000 IES and 2008 NIDS to examine poverty trends over time. The lower bound poverty line of R211 and upper bound poverty line of R322 (both in 2000 prices) were used. They derived a contrasting result from the other studies discussed above, as poverty showed a continuous but slight downward trend between 1993 and 2008. For the lower bound poverty line, the poverty headcount ratio decreased slightly from 0.56 in 1993 to 0.54 in 2000, and this ratio remained at 0.54 in 2008. The poverty headcount ratio also showed a slight decrease from 0.72 in 1993 to 0.71 in 2000, before declining slightly further to 0.70 using the upper bound poverty line. The negligible decline of poverty shown in Leibbrandt *et al*. (2010) contradicts the findings of the other studies as discussed throughout this chapter. However, keep in mind that in Leibbrandt *et al*. per capita income variable was revised by excluding certain income items (e.g. imputed rent, agricultural income, sale of vehicles and fixed property, etc.).

The concern for the volatility of the values of these items was based on the difference in methodology in the measurement of income across surveys. The differences in the measurement methodology may lead to sources of bias. With respect to imputed rent, for instance, the data for the year 2000 do not include values, which could be used to calculate or impute implied rentals, thus making it impossible to compare the data to 1993 or 2008. Furthermore, they find that the distributions of implied rental income variables are quite different. To include the variables for comparison may create differences as a result of measurement error. Differences also arise in the measurement of agricultural income and this could distort comparisons over time and overall results.

3.2.5 Summary

Table 3.1 summarises the general results of studies that examined money-metric trends in poverty after the advent of democracy. The poverty lines used in these studies differ, yet they derive the same poverty trends. The results of the studies using Census/CS data derived similar poverty trends as those using the IES data, that is, both the IES and Census/CS showed that poverty increased from mid-1990s to 2000, before it declined after 2000. Poverty increased between Census 1996 and Census 2001, before a decline occurred between Census 2001 and CS 2007. However, the poverty levels differed amongst these studies. This was due to different poverty lines being used.

Table 3.1: Summary of the money-metric poverty trends since the transition in recent studies

Data	**Studies**	**Poverty trend**
IES 1995 & IES 2000	Van der Berg and Louw (2004)	1995-2000: ↑
IES 1995 & IES 2000	Hoogeveen and Ozler (2006)	1995-2000: ↑
IES 1995 & IES 2000	Pauw and Mncube (2007)	1995-2000: ↑
IES 1995 & IES 2005	Bhorat and Van der Westhuizen (2008)	1995-2005: ↓
IES 1995, IES 2000 & IES 2005/2006	Yu (2008)	1995-2000: ↑ 2000-2005/2006: ↓
Census 1996 & Census 2001	Leibbrandt, Poswell, Naidoo and Welch (2006)	1996-2001: ↑
Census 1996, Census 2001 & CS 2007	Yu (2009)	1996-2001: ↑ 2001-2007: ↓
AMPS 1993-2004	Van der Berg, Burger, Burger, Louw and Yu (2005)	1993-2000: ↑ 2000-2004: ↓
AMPS 1993-2004	Van der Berg, Louw and Yu (2008)	1993-1995: ↑ 1995-2004: ↓
AMPS 1993-2006	Van der Berg, Louw and Du Toit (2008)	1993-1995: ↑ 1995-2006: ↓
AMPS 1993-2004	Van der Berg, Burger, Burger, Louw and Yu (2009)	1993-1995: ↓ 1995-2000: ↑ 2000-2004: ↓
IES 1995 & IES 2000, Census 1996 & Census 2001	Simkins (2004)	1995-2000: ↑ 1996-2001: ↑
PSLSD 1993, IES 2000 & NIDS 2008	Leibbrandt, Woolard, Finn and Argent (2010)	1993-2008: ↓

The results using the AMPS data also found that money-metric poverty increased around the mid 1990s and then decreased considerably in the 2000s. The general reasons stated for the substantial decline in poverty is the dramatic expansion of social grant expenditure,[19] improved labour market prospects,[20] increase in real earnings of the employed for all population groups (Burger and Yu, 2006:6) and faster economic growth.[21] The only study that found that poverty showed a continuous but slight downward trend since 1993 was Leibbrandt *et al*. (2010).

3.3 Literature review of studies on poverty trends using non-money-metric approaches

Although most of the literature on poverty in South Africa has focused on the money-metric approach, there have been studies, although only a few, that use non-money-metric approaches.

3.3.1 Uni-dimensional non-money-metric approaches

As far as the results using uni-dimensional approaches are concerned, first, Bhorat, Poswell and Naidoo (2004) compared Census 1996 with Census 2001 data to illustrate changes in welfare indicators using mainly an asset-based approach. The set of standard indicators is used. These are dwelling types, water access, refuse removal, sanitation, energy types and private goods. Bhorat *et al*. (2004:5) found that the percentage of households living in formal dwellings increased from 64% in 1996 to 68.5% in 2001. Nationally, access to piped water increased from 80% in 1996 to 84.5% in 2001 and electricity for lighting increased from 58% in 1996 to 70% in 2001 (Bhorat *et al*., 2004:6,8). This upward trend is expected as the South African government has invested a great deal in improving basic service delivery[22]. An intervention for improving welfare is government's provision of a package of basic municipal services (Bhorat, Oosthuizen and Van der Westhuizen, 2012: 77). In doing so, households would not need to spend a huge proportion of their income on these basic services. This would impact on non-income poverty.

[19] This is not encouraged, however, because of greater fiscal deficits and the sustainability of the budget. See Tables A.1 and A.2 in the Appendix.
[20] Yu (2008) finds that the number of employed fluctuates greatly, but employment growth shows a continuous and steady increase since LFS2004b. See Figure A.1 in the Appendix.
[21] The South African economy enjoyed positive real GDP growth since the transition, except in 2009 with the onset of the global recession. See Figure A.2 in the Appendix.
[22] Refer to the Figures A.3 – A.7 in the Appendix for government spending on education, housing, water supply, energy and community amenities as proportion of total government spending.

The study by Yu (2009) also considered the trends in non-income welfare across Census 1996, 2001 and the Community Survey 2007. Yu (2009: 19) finds that there was a continuous but slight downward trend in household size. Households living in formal dwellings also increased over the period from 57.5% in 1996 to 66.7% in 2007. With respect to water access, households with access to piped water increased from 60% in 1996 to nearly 70% in 2007. Households having a flush or chemical toilet increased from 50% in 1996 to nearly 60% in 2007. Refuse removal that occurred weekly by some local authority also showed an increase. Over the period the proportion of households using either electricity as fuel source or solar energy for cooking increased to nearly two thirds. Thus it was possible to conclude that there was an improvement in non-income welfare over the period.

3.3.2 Multidimensional non-money-metric approaches

Bhorat, Naidoo and Van der Westhuizen (2006) used PSLSD 1993, OHS 1999 and the 2004 General Household Survey (GHS) data to analyse changes in non-income welfare for the period 1993 to 2004. A non-income-based measure of welfare, an asset index, was constructed. This was done using a technique called factor analysis. With the construction of the asset index, two categories of variables were used – those reflecting access to household characteristics or services, and household assets (Bhorat *et al*., 2006:18). The non-money-metric variables used in the derivation of the multidimensional asset index are dwelling type, type of roof, wall material, water source, fuel for lighting, fuel for cooking, sanitation, cellphone, landline telephone, vehicles and television.

In an initial descriptive overview Bhorat *et al*. (2006:15) found that government asset and service delivery was strongly pro-poor for the period 1993-2004. The results reflect that government biased its delivery to households in the bottom expenditure deciles. Thus households in the lower expenditure deciles benefited more from government service delivery.

Factor analysis was conducted on the pooled sample of the three datasets. Across the three surveys the mean values of the asset index increased, thus reflecting that the average household became less asset poor. Furthermore, when standard measures of poverty were applied to the asset index values, decreases in the headcount asset poverty rates were statistically significant across a range of covariates.

In the study by Bhorat, Van der Westhuizen and Goga (2007) the objective of their study was to provide a comprehensive measure of shifts in welfare between 1993 and 2005. The survey data used were PSLSD 1993, OHS 1999 and GHS 2005. Household welfare indicators include public service variables such as dwelling type, water access, sanitation and electricity for lighting as well as private asset variables such as vehicle ownership, radio, television and telecommunication. Information on years of education and on household expenditure and income is also included in the datasets.

The Public Assets Index provides a measure of household access to basic services. It has weights derived only for variables pertaining to household services. The variables used are dwelling type, type of roof, source of water, energy source for lighting and type of toilet. In contrast, the Private Assets Index reflects assets purchased by households as well as their ownership of human capital, i.e. education. Weights are derived for the variables such as telecommunications, vehicle, radio, television as well as the average years of education of adults. The derived weights were then used to calculate index values for each household in the years 1993, 1999 and 2005. A higher index value implies higher levels of household welfare.

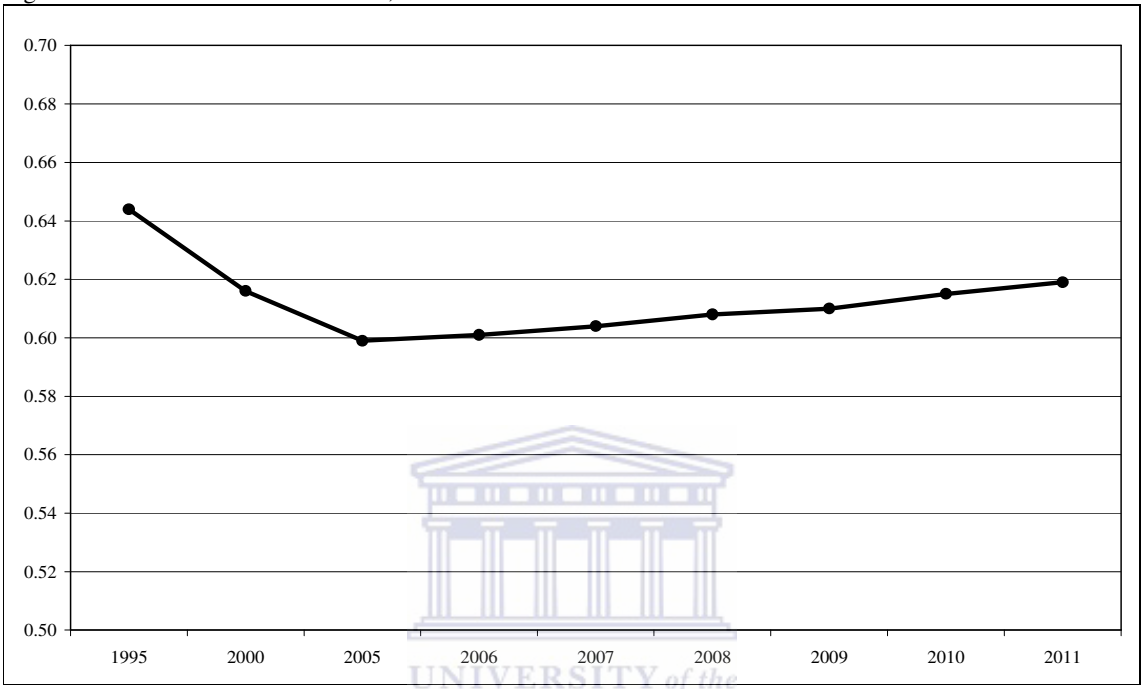
The mean value of the Public Asset Index increased over the period between 1993 and 2005; however, the change was only statistically significant for the period between 1993 and 1999. Thus access to government-provided services increased more quickly over this period compared to the next six years. Ownership of private assets also increased between the period 1993 and 2005, with a much faster increase between 1999 and 2005.

3.4 Studies that consider both money-metric and non-money-metric variables

It is also possible to include both money-metric and non-money-metric variables when deriving a welfare index. The Human Development Index (HDI) of the United Nations Development Programme is an example. In the case of composite indices such as the HDI, it is a weighted average of three dimensions (Boltvinik, 2001: 19). The three indicators used to construct the index are longevity, knowledge and standard of living. The measure of longevity is life expectancy. Educational attainment of an individual is the measure of knowledge. Real GDP per capita is used as the measure for standard of living. Each indicator is given an equal weighting of 33.3% (Todaro and Smith, 2006:61).

Figure 3.1 below shows the HDI[23] of South Africa for the period 1995 to 2011. The HDI index first showed a declining trend between 1995 and 2005. This coincided with the decline in the health index as a result of higher HIV/AIDS infection rates. After that HDI steadily began to increase.

Figure 3.1: HDI index of South Africa, 1995-2011

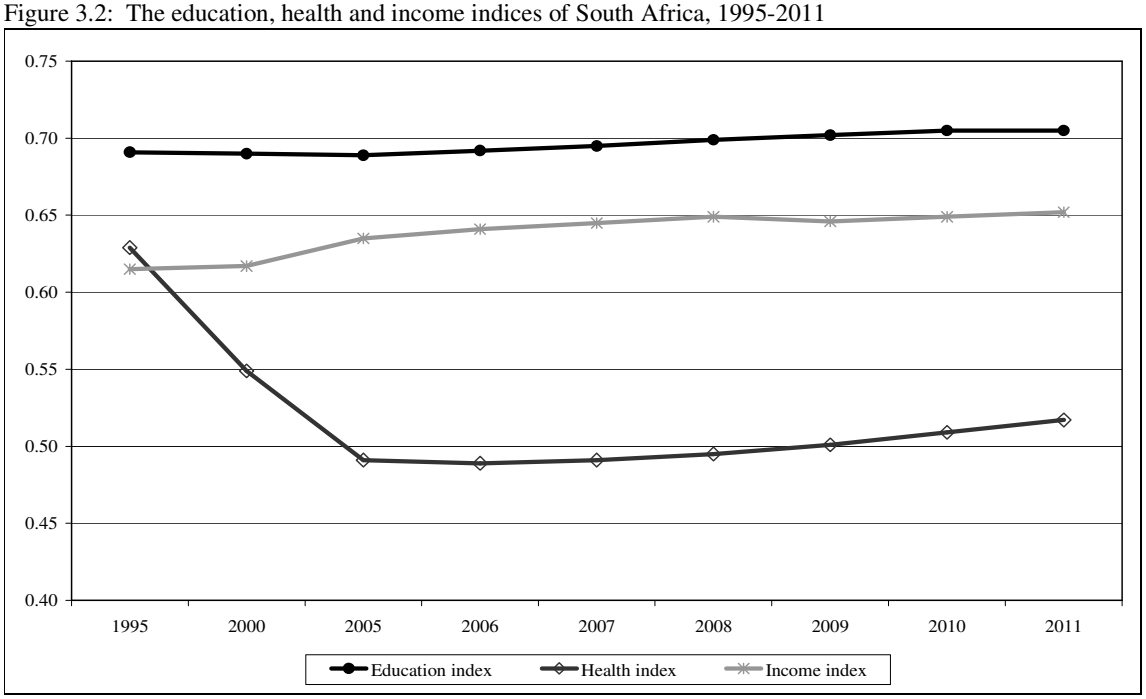


Data source: United Nations Development Programme website.

Figure 3.2 shows the three indicators used when computing HDI as a weighted average of the dimensions. The education index remained fairly stable, increasing only slightly over the period from 0.691 to 0.705. The health index showed a sharp decline from 1995 to 2006. This could be attributed to higher HIV/AIDS infection rates and hence lower life expectancy. After that the health index showed a steady increase. The income index steadily increased from 0.615 in 1995 to 0.652 in 2011.

[23] The HDI attempts to rank all countries on a scale of zero to one, one being the highest human development. HDI values between 1 and 0.8 are considered a high level of human development. Values between 0.79 and 0.5 are considered a medium level and values below 0.49 a low level of human development.

Figure 3.2: The education, health and income indices of South Africa, 1995-2011



Data source: United Nations Development Programme website.

Looking at the other studies, the previously mentioned Bhorat *et al.* (2007) study provided a comprehensive measure of shifts in welfare by looking at both income and non-income welfare between 1993 and 2005. Factor analysis was used to construct a comprehensive household welfare index. The index included both public and private assets, and wage and grant income. Thus both non-income and income dimensions of poverty were taken into consideration.

Index values were calculated from derived weights for all households in each year. A Comprehensive Welfare Index was calculated. The mean values of the index increased over the period, indicating that households experienced an increase in their welfare. Results indicate that total welfare increased over the period of 1993–2005; however, the pace of increase was faster during the first period between 1993 and 1999 because of government service delivery compared to the second period, which was driven by private asset ownership. Statistically significant decreases in headcount rates between 1993 and 2005 are found.

The fuzzy sets approach provides another alternative method for measuring poverty. Where some methods may just assign weights arbitrarily to different dimensions, fuzzy sets do not. The determination of weights is based on the degree of deprivation within a dimension. Thus the approach addresses the issues of horizontal and vertical vagueness of poverty. Studies by Ngwane, Yadavalli and Steffens (2001), Qizilbash (2002), Van der Walt (2004) and Burger,

Van der Berg, Van der Walt and Yu (2004) have used this approach. These studies have either focused on 1995 OHS data as in the case of Ngwane *et al*. (2001), Census 1996 data in Qizilbash (2002) and Van der Walt (2004), while Burger *et al.* (2004) based their analysis on Census 1996 and 2001 data. Thus none of these studies used the CS 2007 data as it was released only well after their studies were conducted.

The study by Ngwane *et al.* (2001) used both the fuzzy sets approach and the traditional approach to measure poverty. It is based on IES 1995 and OHS 1995. A global poverty index was constructed for South Africa using the totally fuzzy and relative approach. Nine dimensions of poverty were selected and grouped into three categories, namely socio-economic, housing and services, and monetary. The nine dimensions were employment status, education, lack of formal dwelling, lack of sanitation, lack of refuse disposal, lack of safe drinking water, lack of telephone, lack of electricity for cooking, and household income.

Poverty was found to differ within the provinces depending on which indicator was used. There were also considerable differences in the resulting provincial ranking. Ngwane *et al.* (2001:83) found that the index was higher for the Eastern Cape and Northern Province[24] and low for the Western Cape and Gauteng. The index was also highest for blacks and the lowest for the white population group. Furthermore, rural areas had a higher index than urban areas.

When comparing the headcount ratios and the global poverty indices for each province, the trend seems to remain the same for the two measures. The only difference occurred for KwaZulu-Natal and Mpumalanga. KwaZulu-Natal is worse off than the Free State and the North West using the global poverty index whereas the headcount ratio indicates the opposite is true.

Van der Walt's (2004) is another study adopting the fuzzy sets approach, but the focus was on deprivation by district council (DC) in the Eastern Cape province using Census 1996 data. Deprivation was studied in all of the districts in the Eastern Cape. The welfare indicators used in the analysis were dwelling, sanitation, energy, refuse, employment, telephone, water, crowding, education and income. With respect to the income variable, Van der Walt (2004) included the zero-income households in the analyses, while households with unspecified income were excluded. It was found that the average deprivation experienced by the Nelson

[24] The Northern Province is now known as Limpopo Province.

Mandela metropolis is lower than other six district councils and O.R. Tambo (DC 15) being the greatest in the province.

Furthermore, average deprivation of households in rural areas is significantly higher than average deprivation in urban areas of the Eastern Cape. The resultant effect of the greatest deprivation being in the traditional authority areas means that the rural areas have deep levels of deprivation. In all seven districts of the Eastern Cape, households that are headed by females experience higher levels of deprivation than their male counterparts. The same can be said for black-headed households with respect to other races.[25]

In the study by Burger *et al*. (2004: 10), ten welfare indicators were used in the derivation of the welfare index: dwelling, sanitation, energy, refuse, employment, telephone, water, crowding, education and income. All the variables were thus non-money-metric variables, except household income. Using Census 1996 and 2001 data, they showed that poverty is linked with geography. In particular, poverty differs quite considerably by geographical region.

Their results pertaining to poverty and deprivation by province indicate what is to be expected. Using the fuzzy sets approach, the deprivation index is higher for provinces such as Limpopo and the Eastern Cape, whereas the Western Cape and Gauteng were the least impoverished provinces in 2001. Thus the chance of being poor is lower in the Western Cape and Gauteng compared to Limpopo or the Eastern Cape. Burger *et al*. (2004: 13) note that the Western Cape, Gauteng and the Northern Cape either did not inherit or had very insignificant shares of the homelands. Change occurred in average poverty by dimension between 1996 and 2001. Welfare has improved overall, with improvement in six dimensions, namely dwelling, energy, telephone, refuse, sanitation and employment. Average welfare has also improved in six of the nine provinces. Average deprivation, however, was higher in the Western Cape, Free State and Gauteng.

Welfare had also increased for all three population groups. The share of Indians is not included because the population is quite low in certain provinces. The black population experienced the strongest increase in welfare over the period between 1996 and 2001. The average poverty by gender of household head is also worse for female-headed households, with Limpopo and the Eastern Cape being the most impoverished regions.

[25] Van der Walt (2004) states that the Asian population in the province is too small to draw any conclusions.

The shortcomings in the study by Burger *et al.* (2004) are that zero-income households were simply accepted and included for analyses, while households with unspecified income as well households headed by people not in the working age (15-65 years) at the time of the survey were excluded from the analyses. The above decisions could affect the reliability and comparability of deprivation across the surveys. These issues are addressed when the total fuzzy approach is applied in Census 1996, Census 2001 and CS 2007 in Chapters Four and Five.

Internationally, the fuzzy set approach has also been used to analyse poverty in various countries. Miceli (1998) used fuzzy sets to measure poverty in Switzerland. The selection of indicators of deprivation was based on four categories, namely housing conditions, durable goods in possession, equivalent expenditure and equivalent disposable income. Equivalence scales were used to make income and expenditure comparable across households of different composition and size. Betti and Cheli (2001) applied fuzzy sets to the analysis of poverty in Great Britain from 1991 to 1997. Data were taken from the British Household Panel Survey. Two different fuzzy measures were considered. The first measure is based on a monetary variable. It is referred to as Fuzzy Monetary. An index was computed for a set of non-monetary indicators[26] to provide supplementary information to that of income. This was referred to as a Fuzzy Supplementary. Supplementary indicators refer to housing attributes and the possession or availability of durable goods.

The study by Betti, Cheli, Lemmi and Verma (2005) applied their analysis to the Italian context for the years 1993 – 2000 on the basis of European Community Household Panel data. Poverty was considered as a fuzzy state and they defined measures of the degree of poverty in different dimensions. These were namely monetary and non-monetary aspects. The standard of living of households can be ascribed to the possession of certain durable goods, housing conditions and general financial conditions. Two measures were constructed, namely Fuzzy Monetary and Fuzzy Supplementary, and were also combined to construct a composite measure to see how these two aspects of deprivation may overlap. Berenger, Villarreal and Celestini (2009) applied the method to census data from Mexico.[27] The chosen indicators reflect the living conditions of households. The indicators make it possible to assess

[26] These indicators were lack of central heating, lack of washing machine, lack of microwave oven, lack of home computer, lack of car/van for private use, lack of colour TV, lack of dishwasher, lack of CD player, lack of VCR and insufficient number of rooms.

[27] The international studies indicated are not relevant to the South African economy and hence will not be discussed further.

deprivation, reflecting the specific use that a person can make with his income. Indicators pertain to the ownership of durable goods, the basic housing characteristics, housing quality and ownership of assets.

3.5 Conclusion

Chapter Three looked at the findings of past studies on poverty levels and trends in South Africa since the transition using money-metric and non-money-metric approaches. A majority of the studies in South Africa adopted the money-metric approach to examine poverty trends since the transition. The money-metric approach showed that poverty worsened in 1994-2000, and only from 2000 there is a continuous downward trend in poverty.

Studies adopting the non-money-metric approach showed that poverty kept declining since the transition; these results are expected as a result of the government's increased expenditure to ensure basic service delivery. However, it needs to be mentioned that some non-money-metric approaches contains certain flaws, as these studies do not clearly indicate which non-money-metric variables play a bigger role in driving poverty down, and whether deprivation/poverty is still serious in particular provinces and areas, and among certain groups of people.

Also, the past fuzzy sets studies included the problematic income variable. By doing so, a substantial number of observations are dropped from the analysis. For this reason in this thesis the data quality and comparability problems of the income variable as well as other variables (if any) are first addressed, before the fuzzy sets approach is adopted in the two censuses and CS 2007. This is the focus of Chapter Four.

CHAPTER FOUR: THE FUZZY SETS APPROACH TO MEASURE DEPRIVATION

4.1 Introduction

The aim of Chapter Four is to discuss the fuzzy sets approach to poverty analysis. The chapter begins by discussing the evolution of the fuzzy sets methodology in Section 4.2. Section 4.3 looks at the survey data that will be used, namely Census 1996, 2001 and Community Survey 2007. In Section 4.4 the horizontal and vertical weights will be derived. Finally Section 4.5 concludes the chapter.

4.2 Methodology

This section will discuss the evolution and development of the fuzzy sets methodology. Using a multidimensional approach such as fuzzy sets will reveal other dimensions of poverty. These would include non-money-metric dimensions such as education, household assets, facilities and access to services, thereby looking at living conditions. This section begins by discussing the fuzzy sets methodology before discussing the data and derivation of weights in the subsequent sections.

Zadeh (1965) originally developed the fuzzy sets approach. Zadeh (1965:338) stated that "often classes of objects encountered ... do not have precisely defined criteria of membership". Zadeh (1965:339) goes on to say that the idea of fuzzy sets is "a class with a continuum of grades of membership". Dubois and Prade (1980) further enhanced this method, which allowed a vague concept such as poverty to be analysed. The traditional money-metric poverty approach, when using the poverty line, makes a distinct separation between poor and non-poor. Fuzzy sets, however, allow individuals to partially belong to either group if they fall between minimum and maximum levels. Cheli and Lemmi (1995) provided a definition for the membership function. Thus the thesis will use the totally fuzzy and relative approach as developed by Cheli and Lemmi (1995).

The degree of membership to a particular fuzzy subset is given by the membership function. If X is allowed to be a set, x can be an element of X. A, a fuzzy subset of X, is defined as: A= $\{x, \mu_A(x)\}$ for all $x \in X$. The mapping of X is $\mu_A(x)$ with the interval [0,1]. This indicates the extent of membership of x to A. Thus $\mu_A(x)$ is the membership function to the extent that should $\mu_A(x) = 0$, x does not belong to the fuzzy subset of A. If $\mu_A(x) = 1$ then x in its entirety

is a member of A. Should $0 < \mu_A(x) < 1$, then x only partly belongs to A. As $\mu_A(x)$ nears 1, the degree of membership with respect to A increases.

This method can be applied to the analysis of poverty. X can represent a set of k poverty dimensions. Let $X = \{X_1, X_2, X_3, \ldots, X_k\}$ in a population of n individuals or households. The membership function of the i^{th} individual in dimension X_j can be represented by $\delta(x_{ij})$. There may be m categories of deprivation in existence in dimension X_j. These categories can be arranged in accordance with risk of poverty. In increasing order, $x^{(1)}_j$ would reflect the lowest risk of poverty. The maximum risk would be reflected by $x^{(m)}_j$. Thus $X_j = \{x^{(1)}_j, x^{(2)}_j, \ldots, x^{(m)}_j\}$ and $x^{(1)}_j < x^{(2)}_j < \ldots < x^{(m)}_j$ with respect to risk of poverty. Cheli and Lemmi's (1995) totally fuzzy and relative approach membership function is defined below:

$$\delta(x_{ij}) = \begin{cases} 0 \\ \delta(x_j^{(\lambda-1)}) + \dfrac{F(x_j^{(\lambda)}) - F(x_j^{(\lambda-1)})}{1 - F(x_j^{(1)})} \end{cases} \text{ if } x_{ij} = x_j^{(1)}$$

$$x_{ij} = x_j^{(\lambda)}, \lambda = 2, \ldots, m$$

where $F(x_j^{(\lambda)})$ is the cumulative distributive function of $x_j^{(\lambda)}$.

They provided a second definition for the membership function. The first was by Cerioli and Zani (1990). Cheli and Lemmi had two important criticisms of earlier method. Firstly, setting the minimum and maximum limits defining the set was arbitrary. As an improvement, their method allows the critical levels to be in agreement with the minimum and maximum categories in each dimension. The method by Cheli and Lemmi (1995) addresses the problems of horizontal and vertical vagueness of poverty. The dimension weights are the horizontal weights. The vertical weights are the assigned values of each category within the dimensions. Cheli and Lemmi's functional form is non-linear as opposed to Cerioli and Zani's linear membership function. This allows the rating of poverty for each category of every dimension to be ascertained by the degree of deprivation experienced by individuals in comparison to the size of other categories. The composite poverty index value can be calculated as follows:

$$\delta_p(x_i) = \sum_{j=1}^{k} w_j \delta(x_{ij}) \quad \forall i = 1, \ldots, n$$

with w_j indicating the weight of dimension X_j and $\sum_{j=1}^{k} w_j = 1$.

For every individual it is a weighted sum of their estimated degree of membership with respect to deprivation dimensions. The proposed weighting system of Cerioli and Zani (1990) is preferred. The weight of each dimension is the inverse function of the number of individuals deprived in a dimension with respect to the reference population. The weighting function is:

$w_j = \log\left(\frac{1}{\bar{\delta}(x_j)}\right)$, where $\bar{\delta}(x_j) = \frac{1}{n}\sum_{i=1}^{n}\delta(x_{ij})$, with $\bar{\delta}(x_j)$, which represents the mean deprivation occurring in dimension X_j.

To determine the poverty of a subset of the population, the subset mean can be calculated as: $\frac{1}{n}\sum_{i=1}^{n}\delta_p(x_i)$, where the subset contains n observations. Finally, the deprivation index ranges between 0 and 1. The higher the index value is, the more deprived the household.[28]

4.3 Data

Data sets used in this thesis are the Census 1996, Census 2001 and CS 2007 conducted by Statistics South Africa. The census data provide detailed information pertaining to the non-money-metric variables and thus provide the means to assess service delivery and allow the study of deprivation by province, race and gender. The nine non-money-metric variables that are included when deriving the aggregate deprivation index are presented in Table 4.1 below. It shows the dimensions of poverty and the categories, which are ranked in increasing order in terms of risk of poverty. The household income variable will not be included because of its known problems. These attributes help to determine the relative deprivation, social exclusion and inability of a household to attain an adequate living standard.

The rankings used are similar to those used by Klasen (2000), Ngwane et al. (2001), Van der Walt (2004) and Burger et al. (2004) with some slight changes. With respect to the fuel source for cooking variable, Klasen (2000) ranked animal dung above wood, whereas Van der Walt (2004) and Burger et al. (2004) ranked wood above animal dung. In this thesis wood and animal dung will be ranked together. Crowding is also included as a variable as done by Van der Walt and Burger et al. It reflects deprivation of space as more persons are in a household.

[28] For the remainder of the thesis, the term 'fuzzy sets approach' will stand for this Cheli & Lemmi method.

Table 4.1: Categories per deprivation dimension

Rank	Census 1996	Census 2001	Community Survey 2007
FUEL SOURCE FOR COOKING			
1. Electricity	Electricity direct from authority	Electricity	Electricity
	Electricity from other source	Solar	Solar
2. Gas	Gas	Gas	Gas
3. Paraffin/Coal	Paraffin	Paraffin	Paraffin
	Coal	Coal	Coal
4. Wood/Dung	Others	Wood	Wood
	Wood	Animal dung	Animal dung
	Animal dung	Other	Other
	Unspecified		
WATER			
1. Tap in dwelling	Piped water in dwelling	Piped water (tap) inside dwelling	Piped water inside dwelling
2. Tap in premises	Piped water on site	Piped water (tap) inside yard	Piped water inside yard
3. Public tap	Public tap	Piped water on community stand: distance less than 200m	Piped water outside yard
		Piped water on community stand: distance more than 200m	
4. Other	Water-carrier/tanker	Borehole	Others
	Borehole/rain-water tank/well	Spring	Borehole
	Dam/river/stream/spring	Rainwater tank	Spring
	Other	Dam/pool/stagnant water	Dam/Pool
	Unspecified	River/stream	River/Stream
		Water vendor	Water vendor
		Other	Rain water tank
REFUSE REMOVAL			
1: Removed once a week	Removed by local authority at least once a week	Removed by local authority at least once a week	Removed by local authority at least once a week
2: Removed less often	Removed by local authority less often	Removed by local authority less often	Removed by local authority less often
3: Communal refuse dump	Communal refuse dump	Communal refuse dump	Communal refuse dump
4: Own refuse dump	Own refuse dump	Own refuse dump	Own refuse dump
5: Other	No rubbish disposal	None	No rubbish disposal
	Other		Other
	Unspecified		
SANITATION			
1: Toilet facility	Flush or chemical toilet	Flush toilet (connected to sewerage system)	Flush toilet (connected to sewerage system)
		Flush toilet (with septic tank)	Flush toilet (with septic tank)
		Chemical toilet	Chemical toilet
2: Pit latrine	Pit latrine	Pit latrine with ventilation (VIP)	Dry toilet facility
		Pit latrine without ventilation	Pit toilet with ventilation
			Pit toilet without ventilation
3. Bucket latrine	Bucket latrine	Bucket latrine	Bucket toilet system
4. Other	Bucket latrine	None	None
	None of the above		
	Unspecified		

Table 4.1: Continued

Rank	Census 1996	Census 2001	Community Survey 2007
DWELLING TYPE			
1: Formal house/flat	House or brick structure	House or brick structure on a separate	House or brick structure on a separate
	Flat in a block of flats	Flat in a block of flats	Flat in block of flats
	Town/cluster/semi-detached house	Town/cluster/semi-detached house	Town/cluster/semi-detached house
	Unit in a retirement village		
2: Single room or flatlet or traditional hut	Traditional dwelling/hut	Traditional dwelling/hut	Traditional dwelling/hut/structure made
	House/flat/room in backyard	House/flat/room, in backyard	House/flat/room in backyard
	Room/flatlet not in backyard	Room/flatlet not in backyard but on a s	Room/flatlet NOT in backyard
	Caravan/Tent	Caravan/Tent	Caravan or tent
3: Informal dwelling	Informal dwelling/shack in backyard	Informal dwelling/shack, in backyard	Informal dwelling/shack in backyard
	Informal dwelling/shack elsewhere	Informal dwelling/shack, not in backyard	Informal dwelling/shack NOT in backyard
	Other dwelling type	Private ship/boat	Private ship/boat
	Unspecified dwelling type		Workers' hostel (bed/room)
			Other
CROWDING – NUMBER OF PERSONS PER ROOM (HOUSEHOLD SIZE / NUMBER OF ROOMS)			
1: [0; 0.25]	1: [0; 0.25]	1: [0; 0.25]	1: [0; 0.25]
2: (0.25; 0.5]	2: (0.25; 0.5]	2: (0.25; 0.5]	2: (0.25; 0.5]
3: (0.5; 0.75]	3: (0.5; 0.75]	3: (0.5; 0.75]	3: (0.5; 0.75]
4: (0.75; 1]	4: (0.75; 1]	4: (0.75; 1]	4: (0.75; 1]
5: (1; 1.5]	5: (1; 1.5]	5: (1; 1.5]	5: (1; 1.5]
6: (1.5; 2]	6: (1.5; 2]	6: (1.5; 2]	6: (1.5; 2]
7: (2; 3]	7: (2; 3]	7: (2; 3]	7: (2; 3]
8: (3+]	8: (3+]	8: (3+]	8: (3+]
LANDLINE TELEPHONE OR CELLPHONE			
1. Yes	In this dwelling/cellular phone	Telephone in dwelling and cellphone	Telephone or cellphone
		Telephone in dwelling only	
		Cell-phone only	
2. No	At a neighbour nearby	At a neighbour nearby	None of both
	At a public telephone nearby	At a public telephone nearby	
	At another location nearby	At another location nearby	
	At another location not nearby	At another location, not nearby	
	No access to a telephone	No access to a telephone	
	Unspecified	Telephone in dwelling and cellphone	
EDUCATIONAL ATTAINMENT OF HOUSEHOLD HEAD			
1. Above Matric	Matric + cert/dip	Matric + cert/dip	Matric + cert/dip
	Degree	Degree	Degree
2: Matric	Matric	Matric	Matric
3: Incomplete secondary	Incomplete secondary	Incomplete secondary	Incomplete secondary
4: Incomplete primary	Incomplete primary	Incomplete primary	Incomplete primary
5: No schooling	No schooling	No schooling	No schooling
LABOUR MARKET STATUS OF HOUSEHOLD HEAD			
1. Employed	Employed (15-65 years)	Employed (15-65 years)	Employed (15-65 years)
2. Inactive or not 15-65 years	Not active (15-65 years) or not aged 15-65 years	Not active (15-65 years) or not aged 15-65 years	Not active (15-65 years) or not aged 15-65 years
3. Unemployed	Unemployed (15-65 years)	Unemployed (15-65 years)	Unemployed (15-65 years)
	Unspecified (15-65 years)	Unspecified (15-65 years)	Unspecified (15-65 years)

A drawback when deriving the ranking categories of the landline telephone or cellphone ownership dimension is that the question was not asked in great detail in CS 2007, as the respondents were only asked whether they have landline telephone at the place of residence or not, as well as whether they have cellphone or not. However, in the two censuses the respondents were asked to indicate the location of the landline telephone in greater detail. Hence, because of the limitation of the landline telephone and cellphone questions in CS 2007, only two categories of deprivation of this dimension could be derived, namely 'having either cellphone or landline telephone in dwelling' and 'having none of both cellphone and landline telephone in dwelling'.

Other dimensions ranking categories that differ slightly are dwelling type, water and educational attainment. In both Van der Walt (2004) and Burger *et al.* (2004), the ranking of these categories in these dimensions is the same. For dwelling type the categories single room or flatlet, traditional hut, shack and homeless are individual categories. In this thesis the categories are simply formal house/flat, single room or flatlet, or traditional hut and informal dwelling. With respect to type of access to water the categories borehole/rain-water tank/well and dam/river/stream/spring are grouped together under the category 'other' for this thesis. For educational attainment, this thesis will simply include the categories above Matric, Matric, incomplete secondary, incomplete primary and no schooling, whereas Van der Walt (2004) and Burger *et al.* (2004) included the additional category, complete primary. It was decided to group people with complete primary (Grade 7) and those with Grades 8-11 together in the category 'incomplete secondary', because of the very low proportion of people with complete primary education. Van der Walt (2004: 20) shows that the proportion of people with complete primary education for the Eastern Cape province is only 8.7% in 1996 and Burger *et al*. (2004:43) show that this proportion is 7% for South Africa in 2001.

It was previously explained that the surveys have a high proportion of households with zero or unspecified income. Burger *et al*. (2004) and Van der Walt (2004) simply accepted the zero-income households and dropped the unspecified-income households from their analyses. The argument could be made that the zero-income and unspecified-income households could have their income imputed by the SRMI method. However, this would still not solve all the problems of the household income variable. Table 4.2 below displays the proportion of households in each annual nominal household income category. The Census 1996 household income categories are hardly comparable with those in Census 2001 and CS 2007 (Yu 2009). Despite the income intervals being the same in 2001 and 2007, this is only so in nominal

terms. Furthermore, it is expected that a higher proportion of households would fall into the higher income categories in Census 2001 and CS 2007 because of the impact of inflation. Hence including this (nominal) income variable would affect the reliability and comparability of the poverty estimates and trends across the three surveys. For this reason it was decided not to include the income variable.

Table 4.2: Proportion of households in each annual nominal household income category in Census 1996, Census 2001 and CS 2007

Census 1996		Census 2001		Community Survey 2007	
R0	12.8%	R0	23.5%	R0	8.19%
R1-R2 400	6.4%	R1-R4 800	8.1%	R1-R4 800	4.99%
R2 401-R6 000	16.2%	R4 801-R9 600	17.8%	R4 801-R9 600	8.98%
R6 001-R12 000	12.4%	R9 601-R19 200	16.0%	R9 601-R19 200	18.99%
R12 001-R18 000	9.8%	R19 201-R38 400	13.0%	R19 201-R38 400	19.14%
R18 001-R30 000	9.0%	R38 401-R76 800	9.1%	R38 401-R76 800	11.48%
R30 001-R42 000	5.0%	R76 801-R153 600	6.6%	R76 801-R153 600	7.65%
R42 001-R54 000	3.8%	R153 601-R307 200	3.8%	R153 601-R307 200	5.35%
R54 001-R72 000	4.1%	R307 201-R614 400	1.4%	R307 201-R614 400	2.86%
R72 001-R96 000	2.8%	R614 401-R1 228 800	0.4%	R614 401-R1 228 800	0.95%
R96 001-R132 000	2.9%	R1 228 801-R2 457 600	0.3%	R1 228 801-R2 457 600	0.33%
R132 001-R192 000	1.8%	R2 457 601 or more	0.2%	R2 457 601 or more	0.23%
R192 001-R360 000	1.3%		100.0%	Response not given	10.87%
R360 001 or more	0.4%				100.0%
Unspecified	11.5%				
	100.0%				

Source: Researcher's own calculations based on Census 1996, Census 2001 and CS 2007 data.

4.4 The derivation of horizontal and vertical weights

Two sets of weights are calculated from the totally fuzzy and relative approach, namely the horizontal weights and vertical weights. Table 4.3 below shows the proportion of households in each ranking category in each dimension for the years 1996, 2001 and 2007.

Table 4.3: Proportion of households in each ranking category in each dimension

Dimension	Rank	Categories	Census 1996	Census 2001	CS 2007
Fuel source for cooking	1	Electricity	46.2%	51.5%	66.46%
	2	Gas	3.2%	2.6%	2.01%
	3	Paraffin/Coal	25.8%	24.2%	16.01%
	4	Wood/Dung	24.8%	21.7%	15.53%
Water	1	Tap in dwelling	42.9%	32.2%	47.17%
	2	Tap on premises	16.9%	29.0%	22.31%
	3	Public tap	19.9%	23.3%	19.24%
	4	Other	20.3%	15.5%	11.28%

Table 4.3: Continued

Dimension	Rank	Categories	Census 1996	Census 2001	CS 2007
Refuse removal	1	Removed once a week	51.0%	55.3%	59.90%
	2	Removed less often	2.3%	1.5%	1.68%
	3	Communal refuse dump	3.3%	1.8%	2.16%
	4	Own refuse dump	33.5%	32.7%	28.82%
	5	Other	10.0%	8.7%	7.44%
Sanitation	1	Toilet facility	49.2%	53.7%	58.15%
	2	Pit latrine	33.4%	28.6%	31.43%
	3	Bucket latrine	4.8%	4.1%	2.19%
	4	Other	12.6%	13.6%	8.24%
Dwelling type	1	House or brick structure	57.2%	63.7%	66.72%
	2	Flat in a block of flats	25.5%	19.7%	15.60%
	3	Town/Cluster/Semi-detached house	17.3%	16.5%	17.68%
Crowding	1	[0; 0.25]	5.4%	6.6%	5.98%
	2	(0.25; 0.5]	15.5%	17.1%	17.94%
	3	(0.5; 0.75]	11.3%	11.8%	12.56%
	4	(0.75; 1]	22.8%	23.9%	24.10%
	5	(1; 1.5]	14.6%	13.8%	13.62%
	6	(1.5; 2]	14.3%	13.4%	12.79%
	7	(2; 3]	9.9%	8.3%	7.87%
	8	(3+]	6.2%	5.0%	5.14%
Telephone	1	Landline telephone in dwelling or cellphone	27.4%	42.4%	76.24%
	2	No landline telephone in dwelling and no cellphone	72.6%	57.6%	23.76%
Education	1	Above Matric	7.6%	8.8%	10.03%
	2	Matric	12.6%	15.9%	14.36%
	3	Incomplete Secondary	38.3%	35.1%	41.06%
	4	Incomplete Primary	17.5%	18.0%	19.97%
	5	No Schooling	24.0%	22.1%	14.58%
Labour market status	1	Employed (15-65 years)	50.6%	44.5%	52.68%
	2	Inactive (15-65 years) or not in working age	35.1%	36.9%	35.55%
	3	Unemployed	14.3%	18.7%	11.77%

Source: Researcher's own calculations based on Census 1996, Census 2001 and CS 2007 data.

The percentage of households with decent welfare in each category shows improvements in formal dwelling, toilet facility, electricity, telephone or cellphone. Categories of dimensions that showed some increase over the period are tap water in dwelling and refuse removed once a week. The categories of dimensions that showed the smallest improvements are household head has at least Matric, household head is employed, and one or fewer than one persons per room.

Table 4.4 below displays the vertical weight in each ranking category for each dimension for the three years. The vertical weights are the assigned values of the categories within the dimensions.

Table 4.4: Vertical weight in each ranking category in each dimension

Dimension	Rank	Categories	Census 1996	Census 2001	CS 2007
Fuel source for cooking	1	Electricity	0.0000	0.0000	0.0000
	2	Gas	0.0595	0.0526	0.0599
	3	Paraffin/Coal	0.5387	0.5524	0.5371
	4	Wood/Dung	1.0000	1.0000	1.0000
Water	1	Tap in dwelling	0.0000	0.0000	0.0000
	2	Tap on premises	0.2959	0.4280	0.4223
	3	Public tap	0.6446	0.7717	0.7865
	4	Other	1.0000	1.0000	1.0000
Refuse removal	1	Removed once a week	0.0000	0.0000	0.0000
	2	Removed less often	0.0461	0.0345	0.0419
	3	Communal refuse dump	0.1126	0.0737	0.0958
	4	Own refuse dump	0.7961	0.8054	0.8145
	5	Other	1.0000	1.0000	1.0000
Sanitation	1	Toilet facility	0.0000	0.0000	0.0000
	2	Pit latrine	0.6577	0.6172	0.7508
	3	Bucket latrine	0.7513	0.7053	0.8032
	4	Other	1.0000	1.0000	1.0000
Dwelling type	1	House or brick structure	0.0000	0.0000	0.0000
	2	Flat in a block of flats	0.5961	0.5438	0.4688
	3	Town/Cluster/Semi-detached house	1.0000	1.0000	1.0000
Crowding	1	[0; 0.25]	0.0000	0.0000	0.0000
	2	(0.25; 0.5]	0.1635	0.1830	0.1908
	3	(0.5; 0.75]	0.2834	0.3095	0.3244
	4	(0.75; 1]	0.5244	0.5653	0.5807
	5	(1; 1.5]	0.6786	0.7131	0.7256
	6	(1.5; 2]	0.8295	0.8569	0.8616
	7	(2; 3]	0.9343	0.9460	0.9453
	8	(3+]	1.0000	1.0000	1.0000
Telephone	1	Landline telephone in dwelling or cellphone	0.0000	0.0000	0.0000
	2	No landline telephone in dwelling and no cellphone	1.0000	1.0000	1.0000
Education	1	Above Matric	0.0000	0.0000	0.0000
	2	Matric	0.1363	0.1746	0.1596
	3	Incomplete Secondary	0.5506	0.5596	0.6160
	4	Incomplete Primary	0.7401	0.7575	0.8379
	5	No Schooling	1.0000	1.0000	1.0000
Labour market status	1	Employed (15-65 years)	0.0000	0.0000	0.0000
	2	Inactive (15-65 years) or not in working age	0.7103	0.6643	0.7513
	3	Unemployed	1.0000	1.0000	1.0000

Source: Researcher's own calculations based on Census 1996, Census 2001 and CS 2007 data.

Table 4.5 shows the average vertical weight for each dimension for the three years. The mean vertical weights of education and crowding are greatest and will thus have lower horizontal weights, indicating greater deprivation in these dimensions. The dwelling and energy dimensions showed improvement, as the mean vertical weights are lower. The mean vertical weight of the telephone variable also declined quite drastically across all three surveys. This is expected as more households have cellphones or at least access to a cellphone. Thus it will be seen that the telephone variable will have a greater horizontal weight in the deprivation

index. Individuals would naturally feel more deprived or poor if they do not have a telephone or cellphone, as most individuals do.

Table 4.5: Average vertical weight in each dimension

	Census 1996	Census 2001	CS 2007
Dwelling	0.3252	0.2726	0.2500
Crowding	0.5494	0.5456	0.5497
Energy	0.3890	0.3522	0.2424
Water	0.3814	0.4589	0.3583
Telephone	0.7264	0.5764	0.2376
Refuse	0.3715	0.3520	0.3119
Sanitation	0.3817	0.3415	0.3359
Employment	0.3920	0.4316	0.3848
Education	0.5978	0.5819	0.5890
	1.0000	1.0000	1.0000

Source: Researcher's own calculations based on Census 1996, Census 2001 and CS 2007 data.

Table 4.6 below shows the horizontal weights for each dimension for the three years. The horizontal weights are the dimension weights. Dwelling and energy were relatively more important contributors to deprivation in all three years. Refuse, sanitation and water were also fairly important contributors. The horizontal weight for the telephone dimension has become much greater. The horizontal weights for dimensions such as crowding, employment and education declined over the three years. The relatively lower weights in these variables indicate a greater prevalence of deprivation in these dimensions.

Burger *et al.* (2004:9) report the horizontal weights for 1996 and 2001 using the same dimensions. They, however, included the problematic nominal household income variable. They also found that dwelling was a relatively more important contributor to deprivation followed by sanitation and energy. The income variable was the least important contributor.

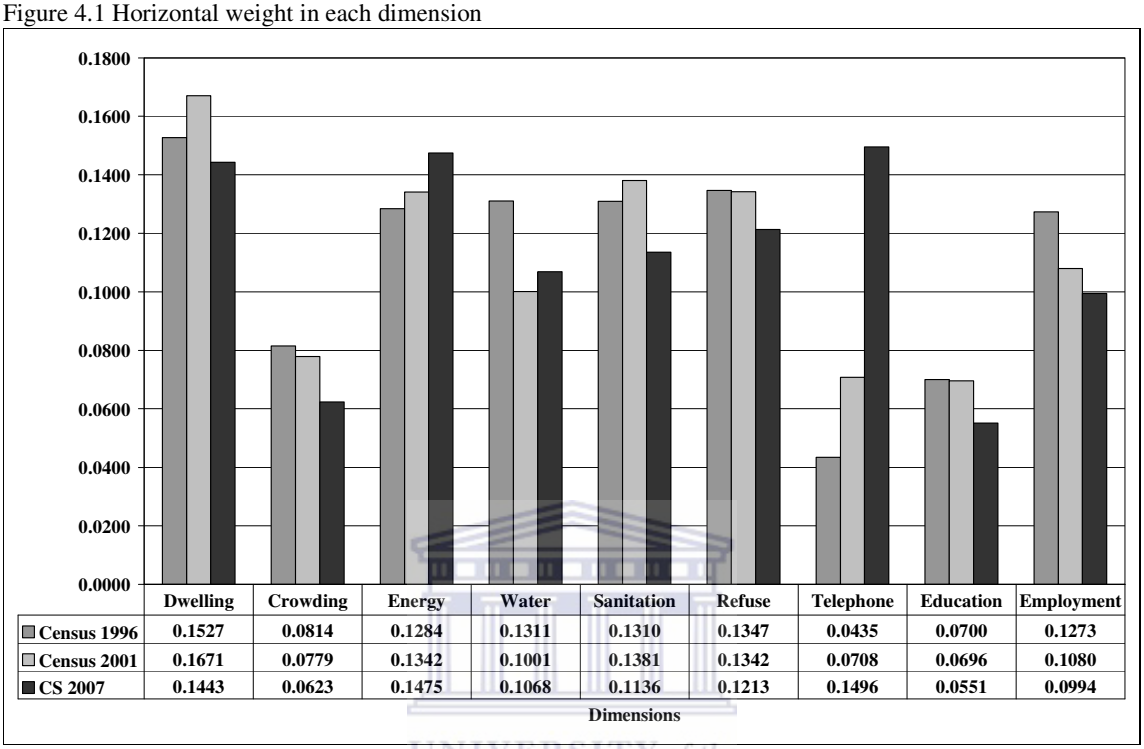
Table 4.6: Horizontal weight in each dimension

	Census 1996	Census 2001	CS 2007
Dwelling	0.1527	0.1671	0.1443
Crowding	0.0814	0.0779	0.0623
Energy	0.1284	0.1342	0.1475
Water	0.1311	0.1001	0.1068
Telephone	0.0435	0.0708	0.1496
Refuse	0.1347	0.1342	0.1213
Sanitation	0.1310	0.1381	0.1136
Employment	0.1273	0.1080	0.0994
Education	0.0700	0.0696	0.0551
	1.0000	1.0000	1.0000

Source: Researcher's own calculations based on Census 1996, Census 2001 and CS 2007 data.

Figure 4.1 below illustrates the horizontal weights in each dimension across the surveys. It is quite evident that the telephone horizontal weight showed the greatest increase over the period.

Figure 4.1 Horizontal weight in each dimension



Source: Researcher's own calculations based on Census 1996, Census 2001 and CS 2007 data.

Burger *et al.* (2004:10) note that the poverty index is basically an index denoting the delivery of services, as most of the dimensions of deprivation are linked to service delivery outcomes such as energy, water, refuse removal, sanitation etc. The index does, however, include two labour market variables, namely employment and education.

This thesis differs from the studies by Burger *et al*. (2004) and Van der Walt (2004) in a number of ways. Firstly, Burger *et al*. (2004) note the deficiencies in census income data, but blindly accepted households with zero earnings. The income variable has a relatively low weight in the deprivation index; however, certain criticisms can still be made because of the inclusion of the variable. Yu (2009:4) finds that a high proportion of households reported zero or unspecified income in censuses. Including the income variable in the multidimensional index of the analysis would require that these households with zero or unspecified income be dropped. The implication of dropping too many observations is that the outcomes would be biased or unreliable. Hence the household income variable is not included in this thesis.

Furthermore, in the studies by Burger *et al.* (2004) households headed by individuals not aged between 15 and 65 years were excluded[29]. Hence, in this thesis it was decided to include these household heads not in the working age for the analyses, and households headed by these people are grouped with households headed by inactive people in the working age.

4.5 Conclusion

Chapter Four set out to discuss the fuzzy sets approach to poverty analysis. The chapter outlined the evolution of the fuzzy sets methodology and discussed the survey data that were used, namely Census 1996, 2001 and Community Survey 2007. The horizontal and vertical weights were also derived. Chapter Five will use the abovementioned vertical weight and horizontal weight variables to derive the deprivation index, before examining the deprivation trends in South Africa since the transition by various demographic (e.g. race, gender, age cohort), geographic (e.g. province and area type of residence), educational attainment and employment characteristics.

[29] Yu (2009:54) shows that the proportion of households headed by someone who is not aged between 15-65 years is as high as 14.4% in Census 1996, 13.6% in Census 2001 and 15% in CS2007. Thus the decision to drop these households may lead to a biased sample.

CHAPTER FIVE: DEPRIVATION IN SOUTH AFRICA: EMPIRICAL ANALYSES

5.1 Introduction

The main purpose of Chapter Five is to use the deprivation indices as derived by the fuzzy sets approach in Chapter Four to examine poverty trends in South Africa between 1996 and 2007. The poverty trends will be critically evaluated and discussed. The chapter begins by discussing poverty and deprivation by province, population group and gender in Section 5.2. In Section 5.3 the OLS regression analysis will be critically evaluated by examining whether any of the explanatory variables are more likely to be associated with higher deprivation. It will thus be possible to establish the significance of various demographic, education, location and labour status variables on deprivation. Section 5.4 continues the analysis by making a comparison between the money-metric approach and non-money-metric approach. Section 5.5 summarises the chapter.

5.2 Deprivation trends since the transition

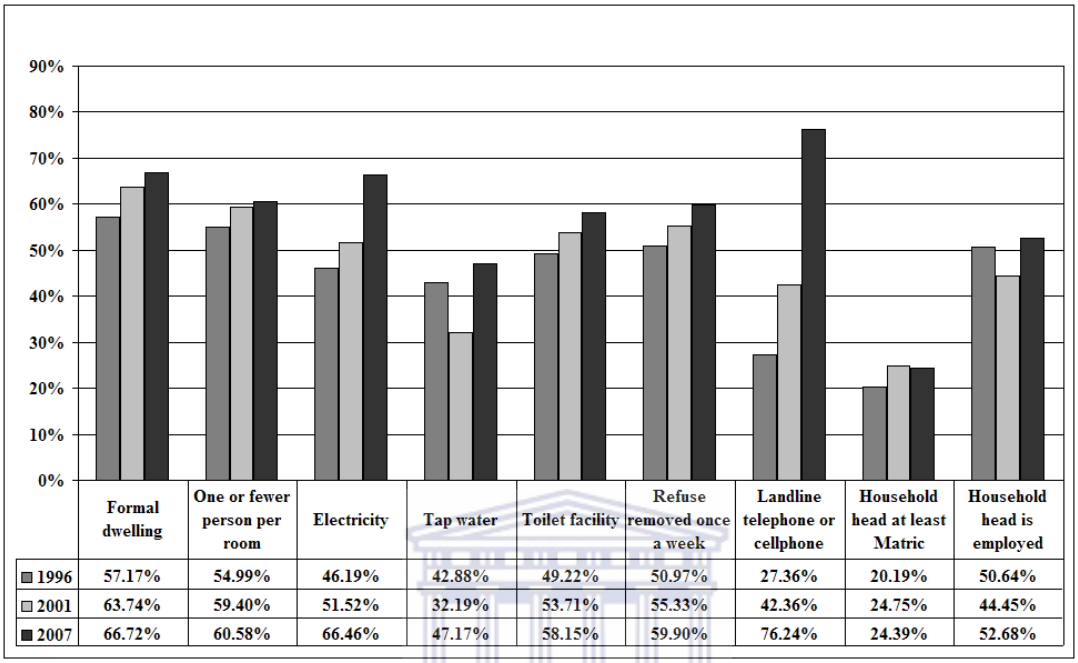
Since the advent of democracy, the South African government has placed great emphasis on the provision of services for the alleviation of poverty. Most of the non-money-metric dimensions used in the fuzzy sets approach are linked to service delivery outcomes. Figure 5.1 below shows that the percentage of households with decent welfare in certain dimensions, linked to service delivery, has shown improvement.[30] Categories that showed improvement over the period are formal dwelling, electricity and landline telephone or cellphone. The huge increase in ownership of landline telephones or cellphones could be attributed to households having increased access to cellphones due to greater affordability of cellphones and the tariff packages.[31] For this reason the cellphone/landline telephone variable will have a greater horizontal weight in Census 2001 and be even greater in CS 2007.[32] Individuals would feel inferior and more deprived if almost everyone around them has either a cellphone and/or landline telephone available.

Categories of dimensions that showed some increase are access to a toilet facility, refuse removed once a week and one or fewer than one person per room. The categories that

[30] Refer to Tables A.3 – A.5 in the Appendix regarding the proportion of households in each ranking category between 1996 and 2007.
[31] See Table 4.2 in Chapter Four. The proportion of households in the landline telephone in dwelling or cellphone category increased tremendously in the telephone dimension.
[32] Refer to Table 4.5 in Chapter Four.

showed a decline initially in 2001 before increasing in 2007 are access to tap water and whether the household head is employed. The only category to show a decline between 2001 and 2007 is whether the household head has at least Matric.

Figure 5.1: The percentage of households with decent welfare in each category

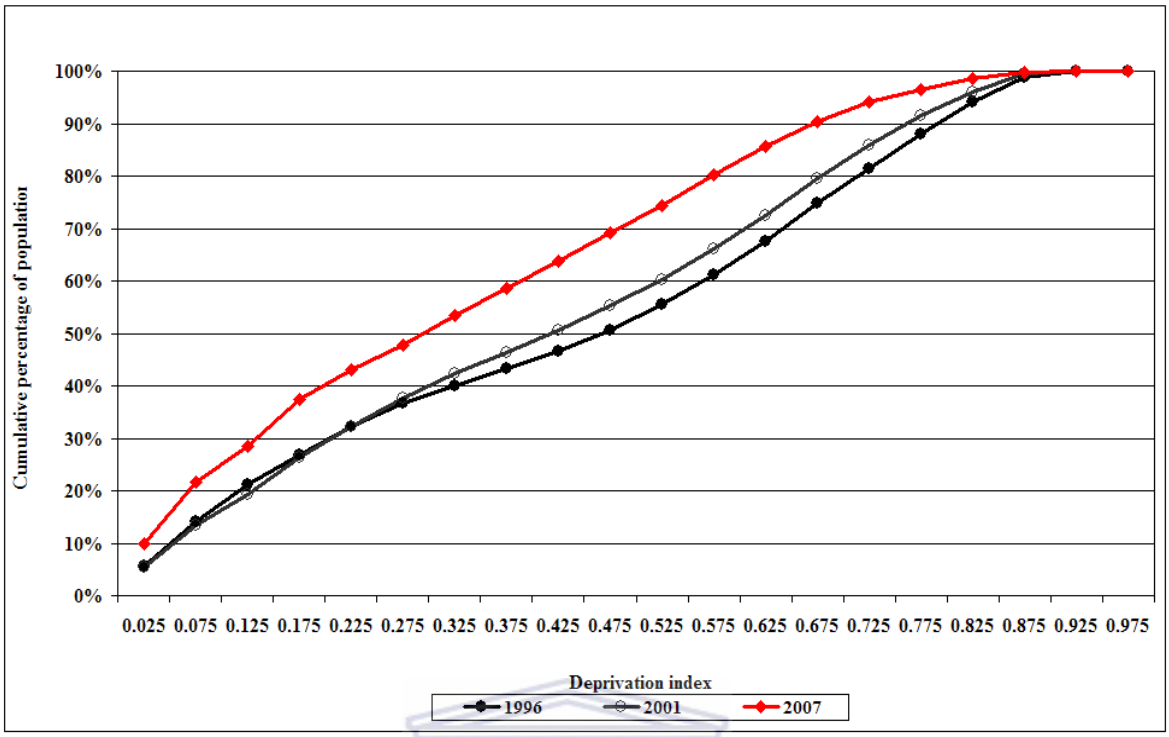


	Formal dwelling	One or fewer person per room	Electricity	Tap water	Toilet facility	Refuse removed once a week	Landline telephone or cellphone	Household head at least Matric	Household head is employed
1996	57.17%	54.99%	46.19%	42.88%	49.22%	50.97%	27.36%	20.19%	50.64%
2001	63.74%	59.40%	51.52%	32.19%	53.71%	55.33%	42.36%	24.75%	44.45%
2007	66.72%	60.58%	66.46%	47.17%	58.15%	59.90%	76.24%	24.39%	52.68%

Source: Researcher's own calculations based on Census 1996, Census 2001 and CS 2007 data.

The cumulative distribution of deprivation in South Africa for 1996-2007 is shown in Figure 5.2 below. The trends for 1996 and 2001 are fairly close with some improvement occurring in 2001. At very low levels of deprivation the cumulative distribution curves are very close. However, a clear divergence begins and continues with a cumulative percentage of 40% of the population in 1996 having a deprivation index of 0.325 or below and 42.3% in 2001. The cumulative distributive function for 2007 shows that an improvement did occur for the whole population as the curve is above the 1996 and 2001 curves. Thus a greater cumulative percentage of the population had lower levels of deprivation. In 2007 a cumulative percentage of 37.4% of the population had a deprivation index of 0.175 or below, whereas in 1996 and 2001 the cumulative percentage of the population was 26.8% and 26.4% respectively.

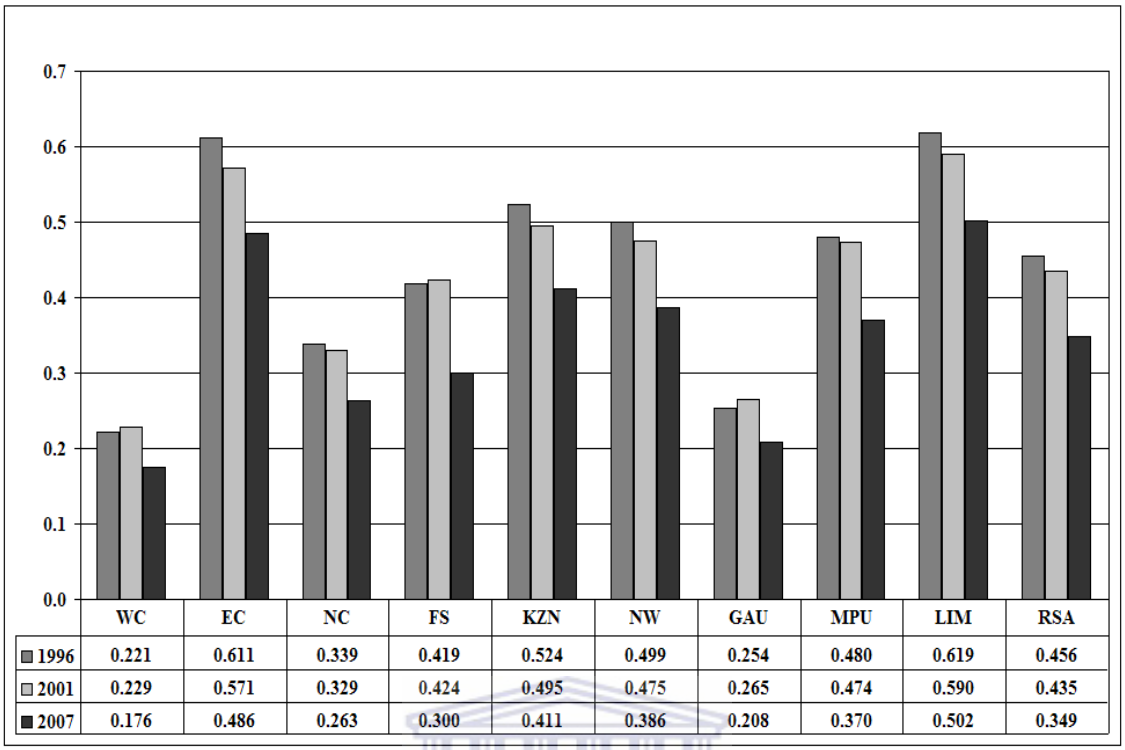
Figure 5.2: Cumulative distribution of deprivation in South Africa, 1996 – 2007



Source: Researcher's own calculations based on Census 1996, Census 2001 and CS 2007 data.

Figure 5.3 below illustrates that the overall mean deprivation in South Africa declined after 1996, decreasing from 0.456 to 0.435 between 1996 and 2001 and then 0.349 in 2007. The mean deprivation index is greater for households in Limpopo and the Eastern Cape and much lower for households in the Western Cape and Gauteng. Hence, as expected, provinces such as the Eastern Cape and Limpopo, with large proportions of people staying in rural areas, had higher mean deprivation indices in all three surveys. The provinces that inherited no or only very minor parts of the old homelands are the Western Cape, Gauteng and the Northern Cape.

Figure 5.3: Mean deprivation index by province, 1996-2007



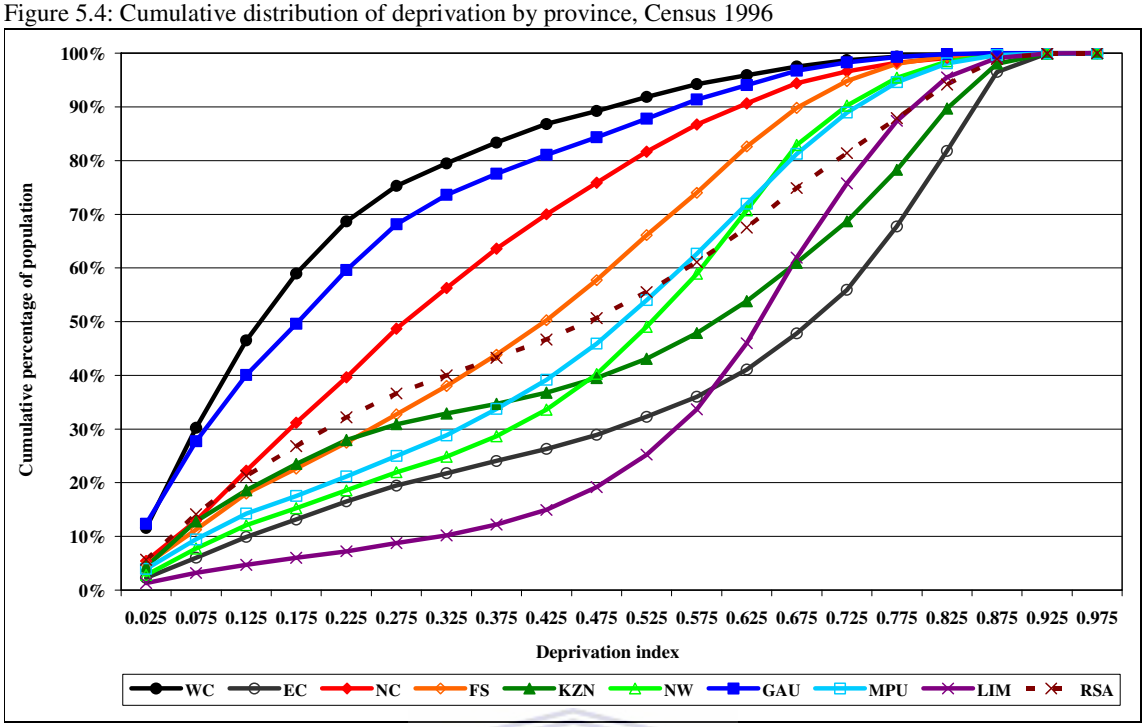
	WC	EC	NC	FS	KZN	NW	GAU	MPU	LIM	RSA
1996	0.221	0.611	0.339	0.419	0.524	0.499	0.254	0.480	0.619	0.456
2001	0.229	0.571	0.329	0.424	0.495	0.475	0.265	0.474	0.590	0.435
2007	0.176	0.486	0.263	0.300	0.411	0.386	0.208	0.370	0.502	0.349

Source: Researcher's own calculations based on Census 1996, Census 2001 and CS 2007 data.

Figures 5.4-5.6 show the cumulative distribution curves by province for 1996, 2001 and 2007 respectively.[33] The general trends found for all three curves are that the better performing provinces are, as expected, the Western Cape, Gauteng and the Northern Cape, with their cumulative distribution curves lying well above the South African curve. These curves bulge towards non-deprivation with a greater percentage of households with a lower deprivation index. As expected, the Eastern Cape and Limpopo are the worst performing provinces, with their curves being well below the South African cumulative distribution curve. Their curves bulge towards the right, with a higher proportion of the population having higher deprivation. Provinces such as KwaZulu-Natal, the North West and Mpumalanga also did not perform as well.

[33] See Figure A.11-A.19 in the Appendix for the cumulative distributive functions per province over the period 1996-2007. The cumulative distributive functions keep moving upwards between 1996 and 2007 in all provinces, indicating an improvement of non-money-metric welfare.

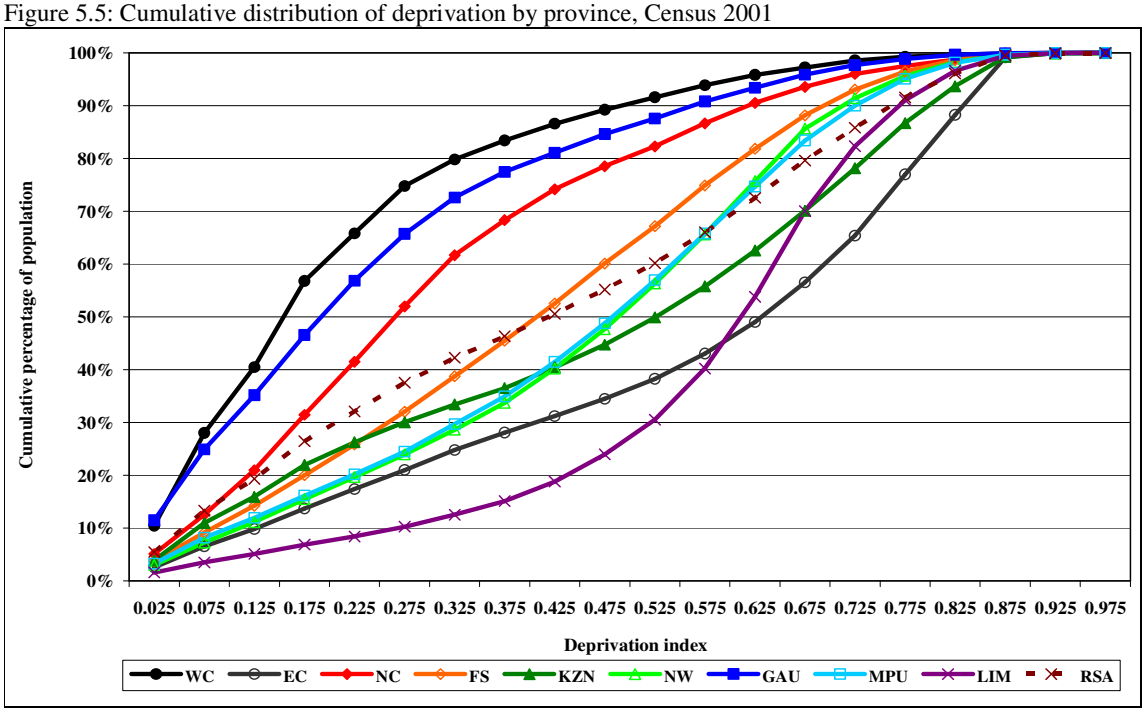
Figure 5.4: Cumulative distribution of deprivation by province, Census 1996



Source: Researcher's own calculations based on Census 1996 data.

The trends in 2001 remained fairly similar to those of 1996, with the Western Cape, Gauteng and the Northern Cape cumulative distribution curves bulging towards non-deprivation with a greater percentage of households with a lower deprivation index. A slight improvement occurred overall, but the Eastern Cape and Limpopo are still the worst performing provinces.

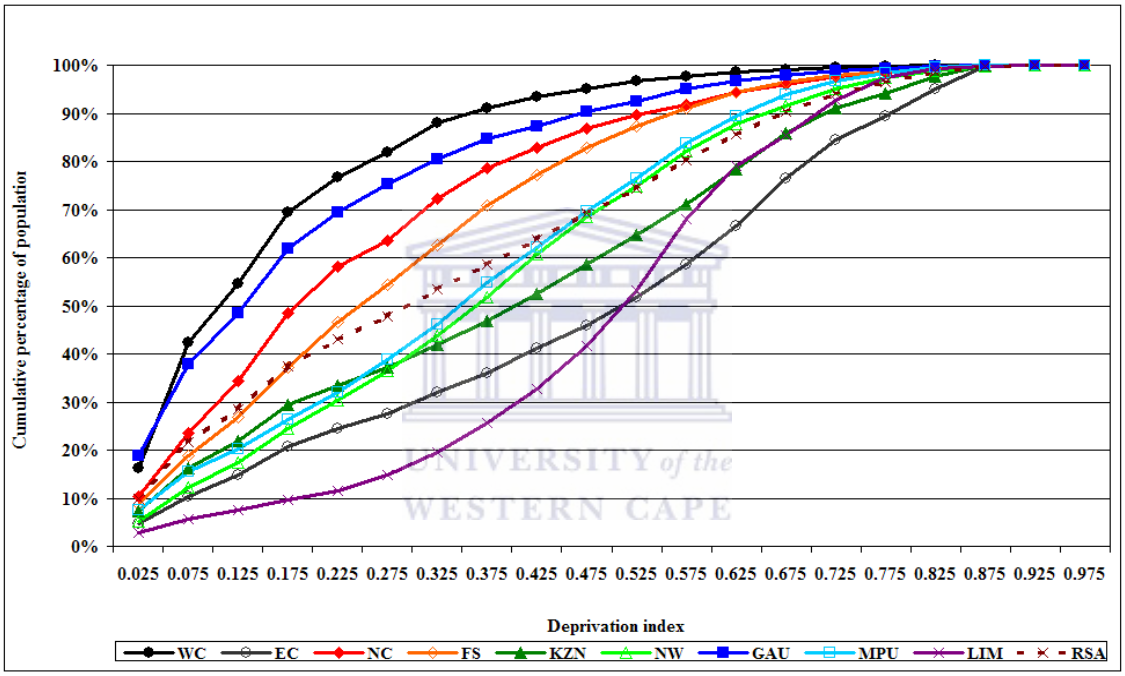
Figure 5.5: Cumulative distribution of deprivation by province, Census 2001



Source: Researcher's own calculations based on Census 2001 data.

In Figure 5.6 the Free State province shows the greatest improvement and is for the most part above the South African cumulative distribution curve. Mpumalanga and the North West also show a considerable improvement. At a deprivation index of 0.375 the cumulative percentage of the population increased from 35% to 54.7% between 2001 and 2007 in Mpumalanga. A similar trend occurs for the North West province with the cumulative percentage of the population with a deprivation index of 0.375 or below increasing from 33.7% to 51.8%. Thus a slightly greater percentage of the population experiences a lower level of deprivation. The Eastern Cape and Limpopo cumulative distribution curves, however, still bulge rightward.

Figure 5.6: Cumulative distribution of deprivation by province, CS 2007



Source: Researcher's own calculations based on CS 2007 data.

Table 5.1 summarises the mean deprivation level by race of head for each province in 1996, 2001 and 2007. The mean deprivation level of each race varies per province but within a broad range. The results coincide with what was seen in Figure 5.7 with blacks having the highest mean deprivation. The Western Cape has the lowest mean deprivation index; however, blacks are worse off in the Western Cape than in Gauteng and the Northern Cape. Although a great proportion of the coloured population resides in the Western Cape, coloureds have a lower mean deprivation in Gauteng than in the Western Cape.

Blacks, despite being the race with the highest mean deprivation over the years, also enjoyed the biggest decline in mean deprivation (0.545 to 0.408) between 1996 and 2007. Burger *et al.*

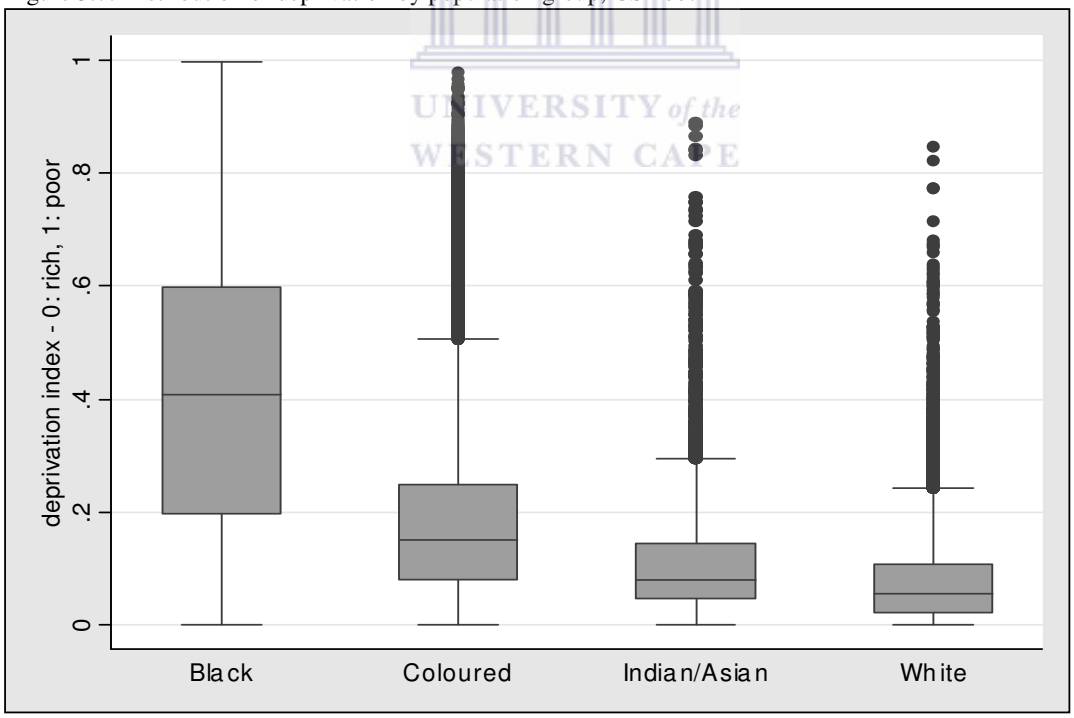
(2004), in their investigation over the period 1996 - 2001, also find that the black population group experienced the strongest rise in welfare. Whites, having the lowest mean deprivation, had the smallest decline in mean deprivation (0.087 to 0.075) between 1996 and 2007. This may be an indication that government's programmes may have been well targeted, with the main beneficiaries of the government's basic service delivery programmes as well as affirmative action policies being the more disadvantaged race groups.

Table 5.1: Mean deprivation by race of head per province, 1996-2007

	Black			Coloured			Indian			White		
	1996	**2001**	**2007**	**1996**	**2001**	**2007**	**1996**	**2001**	**2007**	**1996**	**2001**	**2007**
Western Cape	0.401	0.379	0.254	0.211	0.211	0.169	0.105	0.113	0.100	0.078	0.080	0.069
Eastern Cape	0.664	0.622	0.527	0.298	0.284	0.220	0.144	0.112	0.123	0.101	0.095	0.088
Northern Cape	0.394	0.377	0.307	0.364	0.343	0.274	0.148	0.167	0.170	0.101	0.111	0.092
Free State	0.468	0.457	0.326	0.299	0.329	0.236	0.112	0.083	0.086	0.096	0.104	0.087
KwaZulu-Natal	0.615	0.561	0.463	0.187	0.173	0.132	0.132	0.135	0.113	0.083	0.090	0.073
North West	0.530	0.500	0.406	0.331	0.345	0.287	0.110	0.115	0.165	0.111	0.114	0.104
Gauteng	0.322	0.322	0.252	0.173	0.180	0.140	0.099	0.103	0.084	0.081	0.085	0.069
Mpumalanga	0.522	0.502	0.397	0.280	0.267	0.189	0.116	0.103	0.097	0.097	0.098	0.076
Limpopo	0.631	0.601	0.511	0.384	0.325	0.238	0.181	0.111	0.118	0.130	0.122	0.103
South Africa	0.545	0.507	0.408	0.241	0.235	0.187	0.126	0.127	0.106	0.087	0.090	0.075

Source: Researcher's own calculations based on Census 1996, Census 2001 and CS 2007 data.

Figure 5.7: Distribution of deprivation by population group, CS 2007



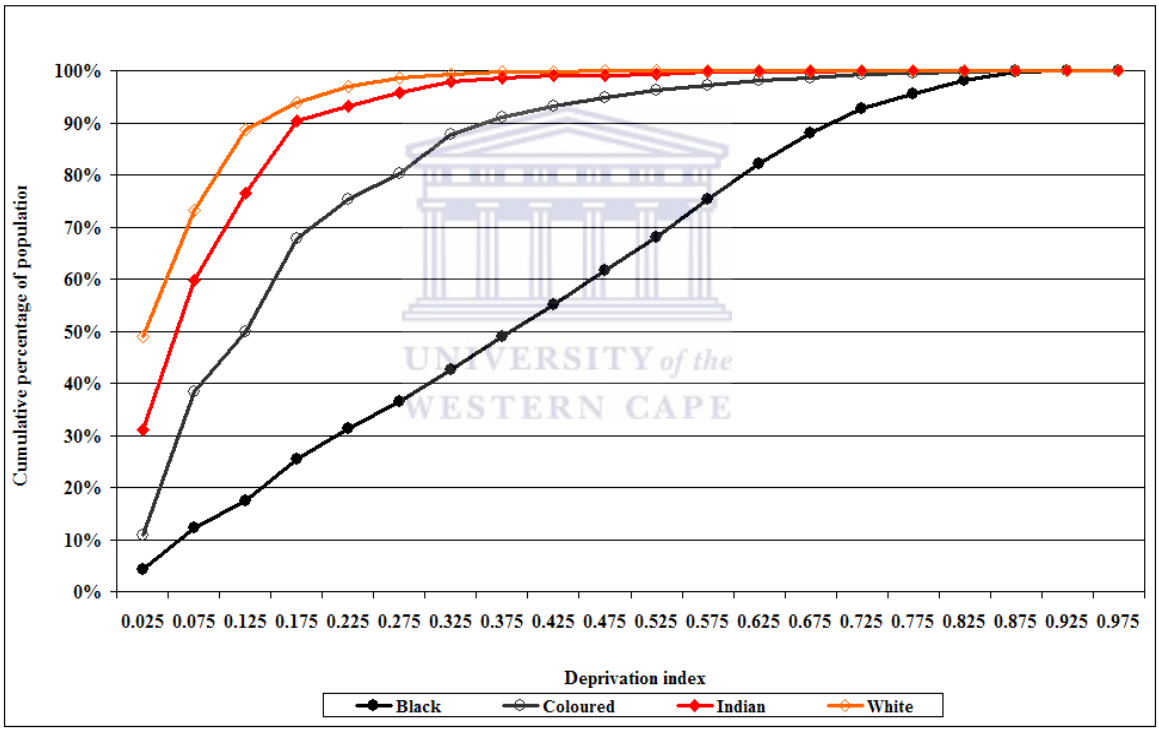
Source: Researcher's own calculations based on CS 2007 data.

Figure 5.7 above shows that the deprivation variation is the greatest in the black race group. This raises the issue of intra-race inequality. The argument is that there are two groups within

the black population, the emerging middle class and those who continue to remain at the bottom[34].

Figure 5.8 shows the cumulative distribution curves for each racial group.[35] The cumulative distributive functions by race look very similar in 1996 and 2001 as in Figure 5.8. It is evident by comparing the different population groups that poverty has a clear racial dimension. The cumulative distribution curves of the white, Indian and even coloured population groups are far above the black cumulative distribution curve. Thus a greater percentage of the population of these racial groups is closer to non-deprivation as these curves bulge to the left. This is in stark contrast to the black distribution curve.

Figure 5.8: Cumulative distribution of deprivation by race, CS 2007



Source: Researcher's own calculations based on CS 2007 data.

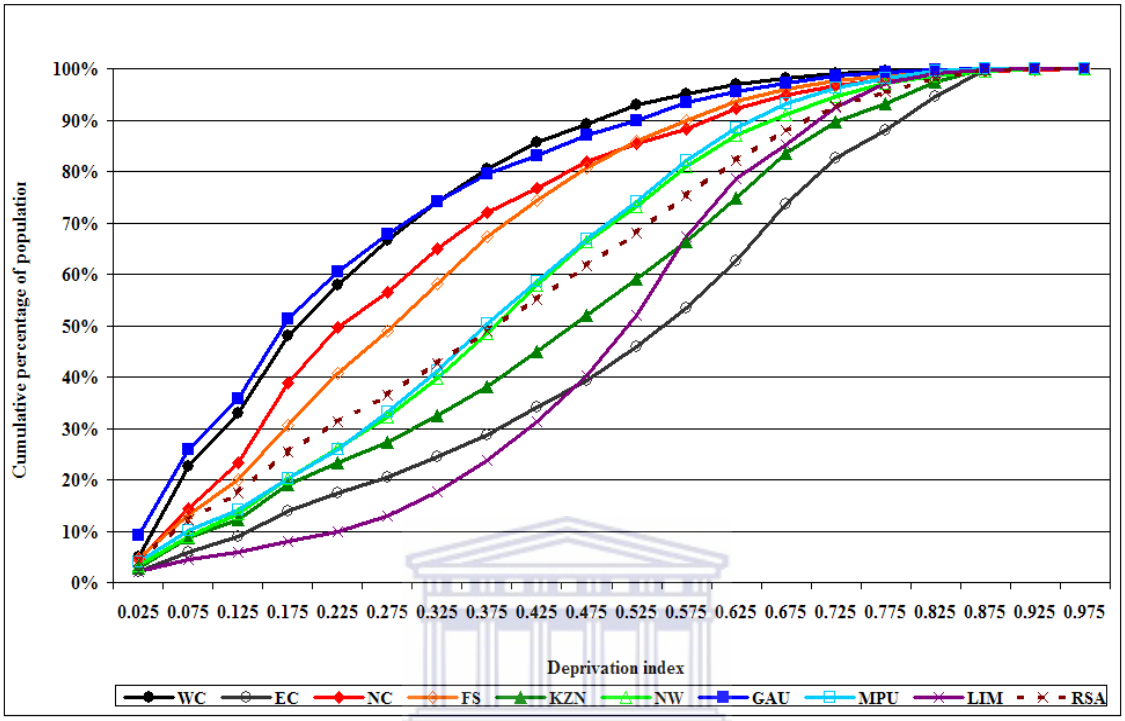
Figures 5.9, 5.10 and 5.11 display the cumulative distribution of deprivation by province for blacks, coloureds and whites in 2007. When making a comparison between these curves, it is clear that there is greater provincial variation in deprivation levels for blacks than for whites in Figure 5.11 and even coloureds in Figure 5.10. The cumulative distribution of deprivation for blacks is better in Gauteng, the Western Cape and the Northern Cape, with a greater

[34] See Bhorat (2004) for further discussion on the emerging black middle class as well as increasing intra-black inequality.

[35] See Figure A.20-A.22 in the Appendix for the cumulative distributive functions per racial group over the period 1996-2007.

cumulative percentage having lower levels of deprivation. Once again provinces that performed poorly are the Eastern Cape, Limpopo and KwaZulu-Natal.

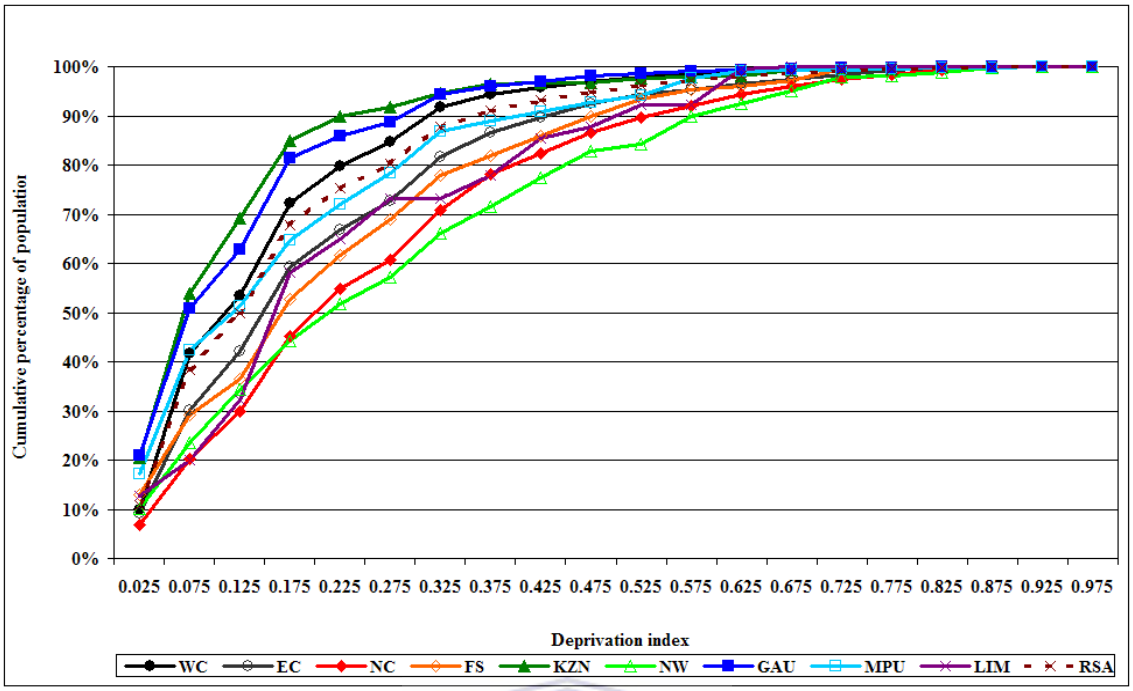
Figure 5.9: Cumulative distribution of deprivation by province for blacks, CS 2007



Source: Researcher's own calculations based on CS 2007 data.

When looking at the shape of the cumulative distribution curves for coloureds, the difference across provinces is not as great as it is for blacks. A greater cumulative percentage of the population has lower levels of deprivation in KwaZulu-Natal, Gauteng and Western Cape. The North West province had the worst outcomes.

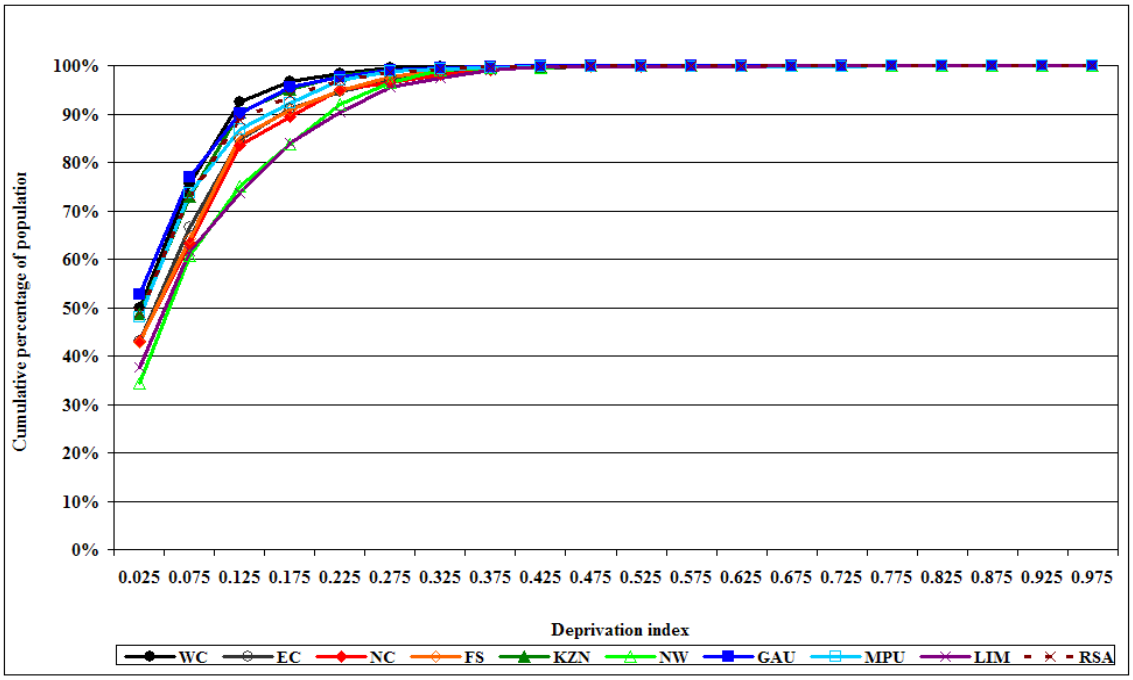
Figure 5.10: Cumulative distribution of deprivation by province for coloureds, CS 2007



Source: Researcher's own calculations based on CS 2007 data.

The shape of the cumulative distribution curves for whites is the least varied across provinces, as seen in Figure 5.11. In all provinces a greater cumulative percentage of the population has lower levels of deprivation. This reinforces the notion that race and poverty are linked, with average deprivation levels being higher for blacks and much lower for whites.

Figure 5.11: Cumulative distribution of deprivation by province for whites, CS 2007



Source: Researcher's own calculations based on CS 2007 data.

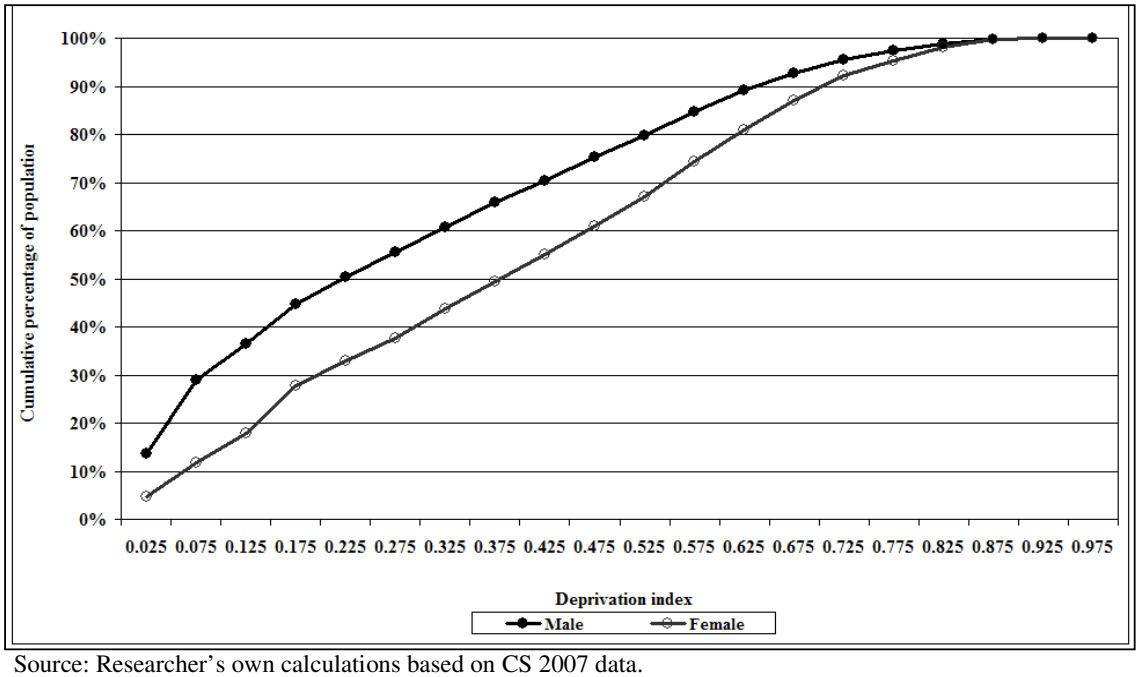
Mean deprivation for female-headed households in South Africa was significantly higher than male-headed households in all three years.[36] Females also showed a more rapid decline in the mean deprivation index. The least deprived provinces, namely the Western Cape and Gauteng, also have the lowest mean level of deprivation for both female- and male-headed households. The most deprived provinces, Limpopo and the Eastern Cape, have the highest mean level of deprivation for both female- and male-headed households. Burger *et al*. (2004) had a similar finding. They found that the average deprivation for males was lower than for females in all provinces in 2001.

Table 5.2: Mean deprivation by gender of head per province, 1996-2007

	Male			Female		
	1996	**2001**	**2007**	**1996**	**2001**	**2007**
Western Cape	0.210	0.216	0.163	0.255	0.256	0.200
Eastern Cape	0.546	0.524	0.446	0.669	0.614	0.521
Northern Cape	0.330	0.322	0.254	0.359	0.342	0.278
Free State	0.395	0.403	0.283	0.465	0.453	0.325
KwaZulu-Natal	0.466	0.440	0.361	0.607	0.553	0.465
North West	0.462	0.450	0.359	0.556	0.508	0.423
Gauteng	0.240	0.248	0.196	0.289	0.294	0.231
Mpumalanga	0.436	0.436	0.331	0.551	0.521	0.422
Limpopo	0.574	0.552	0.468	0.658	0.620	0.531
South Africa	0.396	0.386	0.305	0.545	0.496	0.407

Source: Researcher's own calculations based on Census 1996, Census 2001 and CS 2007 data.

Figure 5.12: Cumulative distribution of deprivation by gender, CS 2007



Source: Researcher's own calculations based on CS 2007 data.

[36] See Figures A.23 and A.24 in the Appendix for the cumulative distributive functions for males and females over the period 1996 – 2007.

Figure 5.12 above displays the cumulative distribution curve for households headed by males and females in 2007. The cumulative percentage of the population for males is 36.6%, with a deprivation index of 0.125, whereas for females it is only 18.0%. Thus it becomes quite obvious that deprivation is also associated with gender. This coincides with the results of Table 5.2, where the mean deprivation index for female-headed households is higher than for male-headed households in all provinces in 2007. Thus the cumulative distribution function for households headed by males is above the curve for female-headed household in Figure 5.12.

Table 5.3 shows the mean deprivation by the employment status of the head of a household for each province. When comparing households that are either headed by an employed or unemployed person, households that have an employed head fare much better in every province for all three years. Burger *et al.* (2004) also found that average poverty for a household with an unemployed head is always worse. With respect to the table below, the least deprived provinces with an employed head are the Western Cape and Gauteng, with Limpopo having the highest deprivation level. Despite the high mean deprivation levels by unemployed, not economically active heads, a slight decline in overall mean deprivation is observed over the period, suggesting that poverty has been alleviated, not necessarily as a result of labour market outcomes, but rather through greater service delivery since the transition.

Table 5.3: Mean deprivation by employment status of head per province, 1996-2007

	Employed			**Not economically active or not aged 15-65 years**			**Unemployed**		
	1996	**2001**	**2007**	**1996**	**2001**	**2007**	**1996**	**2001**	**2007**
Western Cape	0.186	0.183	0.138	0.257	0.246	0.213	0.423	0.415	0.321
Eastern Cape	0.346	0.328	0.341	0.696	0.655	0.571	0.722	0.628	0.505
Northern Cape	0.288	0.276	0.204	0.384	0.358	0.305	0.471	0.439	0.396
Free State	0.351	0.349	0.233	0.476	0.453	0.353	0.561	0.539	0.402
KwaZulu-Natal	0.333	0.300	0.278	0.649	0.592	0.511	0.679	0.595	0.494
North West	0.387	0.368	0.288	0.579	0.539	0.461	0.628	0.560	0.476
Gauteng	0.204	0.198	0.164	0.284	0.292	0.246	0.445	0.423	0.355
Mpumalanga	0.375	0.363	0.277	0.575	0.546	0.470	0.613	0.571	0.481
Limpopo	0.463	0.427	0.371	0.671	0.641	0.565	0.716	0.669	0.579
South Africa	0.300	0.280	0.236	0.578	0.535	0.456	0.622	0.550	0.449

Source: Researcher's own calculations based on Census 1996, Census 2001 and CS 2007 data.

It is generally expected that with greater educational attainment, individuals have greater employability and hence lower the risk of deprivation. Table 5.4 displays the mean deprivation by the educational attainment of head for each province. From the table it can be

seen that household heads that have attained a higher education do have lower mean deprivation levels for all provinces. There are differences within the educational categories concerning the provinces. Limpopo and the Eastern Cape are once again the most deprived provinces, with deprivation becoming exceedingly worse the lower the educational attainment of the household head.

Table 5.4: Mean deprivation by educational attainment of head per province, 1996-2007

	Above Matric			**Complete secondary**			**Incomplete secondary**		
	1996	**2001**	**2007**	**1996**	**2001**	**2007**	**1996**	**2001**	**2007**
Western Cape	0.054	0.065	0.053	0.103	0.130	0.100	0.222	0.241	0.187
Eastern Cape	0.207	0.207	0.166	0.286	0.285	0.227	0.539	0.500	0.429
Northern Cape	0.073	0.083	0.066	0.128	0.145	0.108	0.277	0.291	0.235
Free State	0.091	0.112	0.078	0.177	0.237	0.153	0.376	0.405	0.288
KwaZulu-Natal	0.098	0.128	0.104	0.192	0.224	0.180	0.403	0.400	0.334
North West	0.131	0.153	0.139	0.256	0.277	0.216	0.442	0.439	0.342
Gauteng	0.057	0.075	0.055	0.128	0.172	0.137	0.268	0.295	0.232
Mpumalanga	0.122	0.156	0.112	0.249	0.280	0.204	0.406	0.426	0.329
Limpopo	0.266	0.273	0.212	0.423	0.416	0.348	0.575	0.563	0.470
South Africa	0.105	0.124	0.094	0.194	0.221	0.171	0.384	0.384	0.310
	Incomplete primary			**No schooling**					
	1996	**2001**	**2007**	**1996**	**2001**	**2007**			
Western Cape	0.318	0.318	0.249	0.380	0.376	0.280			
Eastern Cape	0.685	0.637	0.575	0.752	0.721	0.646			
Northern Cape	0.399	0.397	0.328	0.475	0.450	0.385			
Free State	0.499	0.494	0.358	0.555	0.529	0.424			
KwaZulu-Natal	0.616	0.567	0.500	0.720	0.677	0.603			
North West	0.560	0.536	0.440	0.613	0.588	0.514			
Gauteng	0.377	0.378	0.299	0.401	0.403	0.333			
Mpumalanga	0.529	0.518	0.424	0.594	0.578	0.497			
Limpopo	0.646	0.626	0.545	0.691	0.665	0.591			
South Africa	0.547	0.517	0.441	0.645	0.622	0.543			

Source: Researcher's own calculations based on Census 1996, Census 2001 and CS 2007 data.

Poverty is substantially higher in rural areas than in urban areas in both 1996 and 2001,[37] as demonstrated in Table 5.5. The mean deprivation in rural areas is highest in the Eastern Cape, KwaZulu-Natal and Limpopo, and lowest for the Western Cape and Gauteng. The difference between rural and urban deprivation is also lowest for the Western Cape. Burger *et al*. (2004) also find that rural poverty is greater than urban poverty and particularly severe in the Eastern Cape, KwaZulu-Natal and Limpopo.

[37] The area type variable was not available in the CS 2007.

Table 5.5: Mean deprivation by area type per province, 1996-2001

	Urban		Rural	
	1996	**2001**	**1996**	**2001**
Western Cape	0.206	0.218	0.343	0.328
Eastern Cape	0.309	0.320	0.763	0.723
Northern Cape	0.297	0.288	0.446	0.491
Free State	0.362	0.384	0.555	0.555
KwaZulu-Natal	0.263	0.275	0.721	0.672
North West	0.314	0.330	0.600	0.573
Gauteng	0.249	0.258	0.413	0.473
Mpumalanga	0.312	0.327	0.586	0.576
Limpopo	0.275	0.313	0.658	0.622
South Africa	0.269	0.281	0.666	0.634

Source: Researcher's own calculations based on Census 1996 and Census 2001 data.

Unemployment is greatest amongst South African youths (World Bank 2011:5). It is therefore expected that, because of this labour market outcome, mean deprivation will be higher in households headed by persons in the younger age groups. Table 5.6 shows the mean deprivation by age of head per province. Mean deprivation is higher in all provinces in the younger age groups. The mean deprivation declines in the 25-34 year age group and declines even further in the 35-44 year age group, before worsening again. A great deal of provincial variation also occurs within the age categories. Limpopo and the Eastern Cape are the most impoverished provinces.

Table 5.6: Mean deprivation by age of head per province, 1996-2007

	15-24 years			25-34 years			35-44 years		
	1996	**2001**	**2007**	**1996**	**2001**	**2007**	**1996**	**2001**	**2007**
Western Cape	0.296	0.321	0.238	0.246	0.268	0.212	0.206	0.221	0.170
Eastern Cape	0.655	0.608	0.501	0.570	0.526	0.418	0.561	0.525	0.422
Northern Cape	0.415	0.416	0.377	0.334	0.337	0.280	0.308	0.316	0.250
Free State	0.477	0.484	0.355	0.414	0.439	0.308	0.392	0.403	0.278
KwaZulu-Natal	0.538	0.505	0.417	0.476	0.445	0.351	0.475	0.459	0.363
North West	0.553	0.513	0.424	0.471	0.461	0.379	0.459	0.441	0.348
Gauteng	0.318	0.334	0.280	0.279	0.291	0.237	0.247	0.261	0.202
Mpumalanga	0.537	0.524	0.418	0.455	0.458	0.344	0.433	0.435	0.333
Limpopo	0.642	0.615	0.525	0.595	0.572	0.477	0.583	0.554	0.456
South Africa	0.526	0.493	0.397	0.421	0.406	0.318	0.409	0.398	0.305
	45-54 years			**55-65 years**					
	1996	**2001**	**2007**	**1996**	**2001**	**2007**			
Western Cape	0.199	0.206	0.156	0.218	0.214	0.162			
Eastern Cape	0.572	0.539	0.459	0.647	0.600	0.506			
Northern Cape	0.328	0.310	0.249	0.348	0.335	0.253			
Free State	0.399	0.408	0.276	0.429	0.425	0.313			
KwaZulu-Natal	0.496	0.482	0.388	0.560	0.518	0.434			
North West	0.480	0.459	0.365	0.520	0.494	0.396			
Gauteng	0.228	0.245	0.189	0.237	0.242	0.187			
Mpumalanga	0.458	0.458	0.337	0.513	0.497	0.390			
Limpopo	0.608	0.582	0.483	0.642	0.610	0.517			
South Africa	0.425	0.414	0.323	0.490	0.460	0.368			

Source: Researcher's own calculations based on Census 1996, Census 2001 and CS 2007 data.

The preceding figures and tables look mainly at poverty from a national perspective, with the provinces being the smallest geographical area. Table 5.7 to Table 5.12 illustrate the results of poverty within provinces. Using the deprivation index, the best performing magisterial district, municipality and district council can be identified. The worst performing areas, namely those that either deteriorated or showed only a slight improvement in their mean deprivation index, can also be distinguished.

Table 5.7 below shows the change in mean deprivation by magisterial district[38] between 1996 and 2001. The magisterial district that displayed the greatest improvement was Cullinan in Gauteng. The three best performing magisterial districts were from Gauteng, the Eastern Cape and the Northern Cape. In contrast, Table 5.8 shows worst performing magisterial districts. Instead of an improvement occurring over this period, the mean deprivation of these magisterial districts increased. Four of these magisterial districts were from Limpopo.[39]

Table 5.7: The 10 magisterial districts with the biggest decrease of mean deprivation between 1996 and 2001

Province	Magisterial district code	Magisterial district name	Census 1996	Census 2001	Difference
Gauteng	721	Cullinan	0.496	0.316	-0.180
Eastern Cape	245	Keiskammahoek	0.714	0.624	-0.089
Northern Cape	316	Kenhardt	0.388	0.303	-0.086
KwaZulu-Natal	535	Hlabisa	0.727	0.643	-0.084
Mpumalanga	816	Waterval Boven	0.426	0.343	-0.083
Eastern Cape	207	Barkley-East	0.577	0.496	-0.081
KwaZulu-Natal	537	Mthonjaneni	0.784	0.705	-0.079
Western Cape	141	Murraysburg	0.445	0.368	-0.077
Eastern Cape	243	Zwelitsha	0.561	0.486	-0.075
KwaZulu-Natal	536	Lower Umfolozi	0.570	0.495	-0.075

Source: Researcher's own calculations based on Census 1996 and Census 2001data.

Table 5.8: The 10 magisterial districts with the biggest increase of mean deprivation between 1996 and 2001

Province	Magisterial district code	Magisterial district name	Census 1996	Census 2001	Difference
Eastern Cape	220	King William's Town	0.228	0.404	0.176
Mpumalanga	823	Witrivier	0.302	0.476	0.174
Limpopo	904	Pietersburg	0.220	0.354	0.133
Northern Cape	319	Herbert	0.432	0.537	0.105
Limpopo	903	Phalaborwa	0.235	0.335	0.100
Free State	432	Clocolan	0.491	0.585	0.094
Western Cape	112	Wellington	0.221	0.311	0.090
Limpopo	906	Potgietersrus	0.418	0.502	0.084
Limpopo	905	Soutpansberg	0.330	0.413	0.083
Free State	408	Welkom	0.286	0.363	0.077

Source: Researcher's own calculations based on Census 1996 and Census 2001data.

[38] The magisterial district variable is only available in Census 1996 and Census 2001.
[39] See Table A.7 for the mean deprivation for all magisterial districts.

Table 5.9 and Table 5.10 below show the change in mean deprivation by municipality[40] between 2001 and 2007.[41] The best performing municipalities all showed an improvement in lowering the mean deprivation. Table 5.10 displays the results of the bottom ten, those with the smallest decline in the mean deprivation index. The mean deprivation of two municipalities actually increased over the period. These municipalities were West Rand in Gauteng and Benede Oranje in the Northern Cape. Overall six of the worst performing municipalities were from the Northern Cape.

Table 5.9: The 10 municipalities with the biggest decrease of mean deprivation between 2001 and 2007

Code	Name	Census 2001	CS 2007	Difference
893	MPDMA32: Lowveld	0.629	0.327	-0.301
996	CBDMA4: Kruger Park	0.275	0.066	-0.208
601	NW371: Moretele	0.573	0.390	-0.183
917	NP365: Modimolle	0.497	0.325	-0.172
418	FS203: Ngwathe	0.422	0.251	-0.171
206	EC106: Sunday's River Valley	0.481	0.311	-0.171
803	MP303: Mkhondo	0.615	0.451	-0.163
413	FS192: Dihlabeng	0.448	0.286	-0.163
409	FS183: Tswelopele	0.500	0.340	-0.161
407	FS181: Masilonyana	0.480	0.327	-0.153

Source: Researcher's own calculations based on Census 2001 and CS 2007 data.

Table 5.10: The 10 municipalities with the smallest decrease of mean deprivation between 2001 and 2007

Code	Name	Census 2001	CS 2007	Difference
393	NCDMA08: Benede Oranje	0.412	0.438	0.026
791	GTDMA41: West Rand	0.390	0.394	0.005
311	NC075: Renosterberg	0.342	0.322	-0.020
301	NC061: Richtersveld	0.229	0.208	-0.021
88	CBLC8: Merafong City	0.316	0.294	-0.022
316	NC082: Kai !Garib	0.366	0.344	-0.022
305	NC066: Karoo Hoogland	0.352	0.328	-0.024
313	NC077: Siyathemba	0.309	0.284	-0.025
809	MP312: Emalahleni	0.319	0.292	-0.027
502	KZ212: Umdoni	0.431	0.404	-0.027

Source: Researcher's own calculations based on Census 2001 and CS 2007 data.

Table 5.11 and Table 5.12 below show the change in mean deprivation by district council[42] between 2001 and 2007.[43] Table 5.11 shows the district councils that have the greatest decline of the mean deprivation index. In this case the bottom ten are the district councils with the smallest decline in mean deprivation. It is interesting to note that the City of Cape Town is in the bottom five; however, its mean deprivation by district council is the least.

[40] The municipality variable is only available in Census 2001 and the CS 2007.
[41] See Table A.8 in the Appendix for the mean deprivation for all municipalities.
[42] The district council variable is only available in Census 2001 and the CS 2007.
[43] See Table A.9 in the Appendix for the mean deprivation for all district councils.

Table 5.11: The 10 district councils with the biggest decrease of mean deprivation between 2001 and 2007

Code	Name	Census 2001	CS 2007	Difference
18	DC18: Lejweleputswa District Municipality	0.422	0.288	-0.133
20	DC20: Northern Free State District Municipality	0.373	0.242	-0.130
30	DC30: Govan Mbeki Municipality	0.486	0.359	-0.127
27	DC27: Umkhanyakude District Municipality	0.703	0.580	-0.123
19	DC19: Thabo Mofutsanyane District Municipality	0.500	0.378	-0.122
17	DC17: Motheo District Municipality	0.389	0.270	-0.119
10	DC10: Cacadu District Municipality	0.383	0.265	-0.118
32	DC32: Ehlanzeni	0.495	0.378	-0.117
37	DC37: Bojanala District Municipality	0.489	0.374	-0.115
81	CBDC1: Kgalagadi District Municipality	0.556	0.452	-0.104

Source: Researcher's own calculations based on Census 2001 and CS 2007 data.

Table 5.12: The 10 district councils with the smallest decrease of mean deprivation between 2001 and 2007

Code	Name	Census 2001	CS 2007	Difference
776	Pretoria: City of Tshwane Metropolitan Municipality	0.282	0.237	-0.045
88	CBDC8: West Rand District Municipality	0.311	0.262	-0.049
171	Cape Town: City of Cape Town	0.216	0.166	-0.049
2	DC2: Boland District Municipality	0.246	0.194	-0.051
8	DC8: Siyanda District Municipality	0.339	0.288	-0.051
82	CBDC2: Metsweding District Municipality	0.353	0.300	-0.053
774	Johannesburg: City of Johannesburg Metropolitan Municipality	0.244	0.188	-0.056
4	DC4: Eden District Municipality	0.272	0.215	-0.057
38	DC38: Central District Municipality	0.514	0.457	-0.058
6	DC6: Namakwa District Municipality	0.294	0.232	-0.062

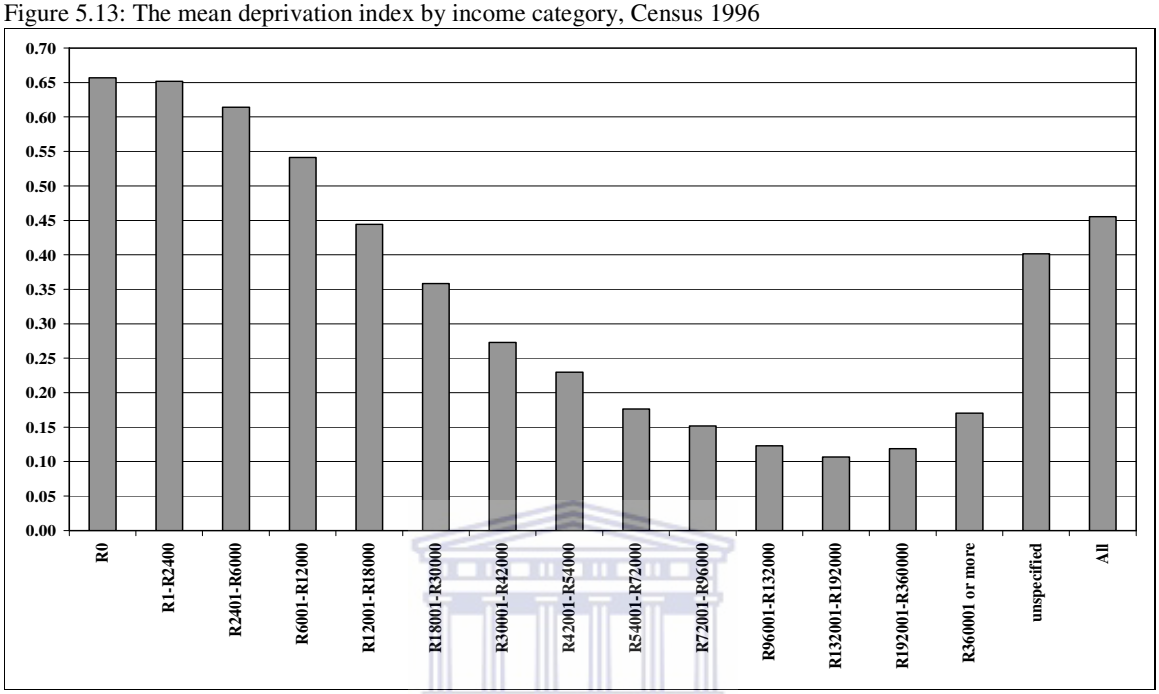
Source: Researcher's own calculations based on Census 2001 and CS 2007 data.

Figures 5.12, 5.13 and 5.14 illustrate the results of Tables A.13, A.14 and A.15 in the Appendix.[44] There may be households that, although indicated R0 or low-income, still experienced a minimum deprivation index of 0, which could imply misreporting. Yu (2009:13) shows that the household income variable as derived by Stats SA in 1996 is clearly problematic, as Stats SA did not apply the three rules they used properly when deriving household income. The income bands in each survey are in nominal terms and, even though they are the same for 2001 and 2007, they are not consistent between 1996 and 2001. The household income variable was also derived differently across the surveys. Hence given the change in household income categories over the three surveys, the tables in the Appendix are not directly comparable.

[44] Also see Appendix, Table A.10, A.11 and A.12 for a comparison between the deprivation index and the problematic household income variable for 1996, 2001 and 2007.

Figure 5.13 below shows the mean deprivation index by income category in 1996. The downward trend seen in the mean deprivation is expected as income category increases. Thus the mean deprivation is higher for the lower income categories and lower as income increases.

Figure 5.13: The mean deprivation index by income category, Census 1996

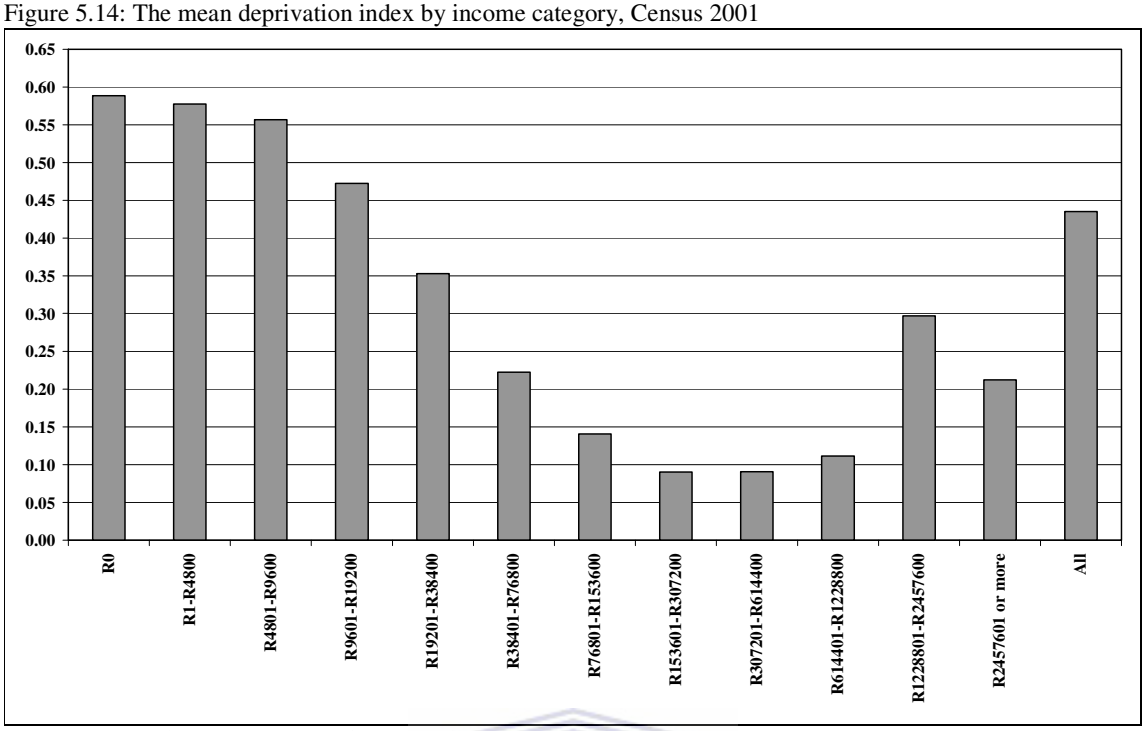


Source: Researcher's own calculations based on Census 1996 data.

In Figure 5.14 below the mean deprivation index is once again much higher for the lower income categories. The mean deprivation index becomes lower as household income increases. This, however, occurs only up until the R307 201 to R614 400 category, and then the mean deprivation index worsens again. In the last three income categories some fluctuation occurs. This indicates that households may have either falsely reported or incorrectly stated their household income.[45]

[45] See Table A.11 in Appendix. Even at R0 and low-income levels, a certain proportion of households do have a low deprivation index.

Figure 5.14: The mean deprivation index by income category, Census 2001

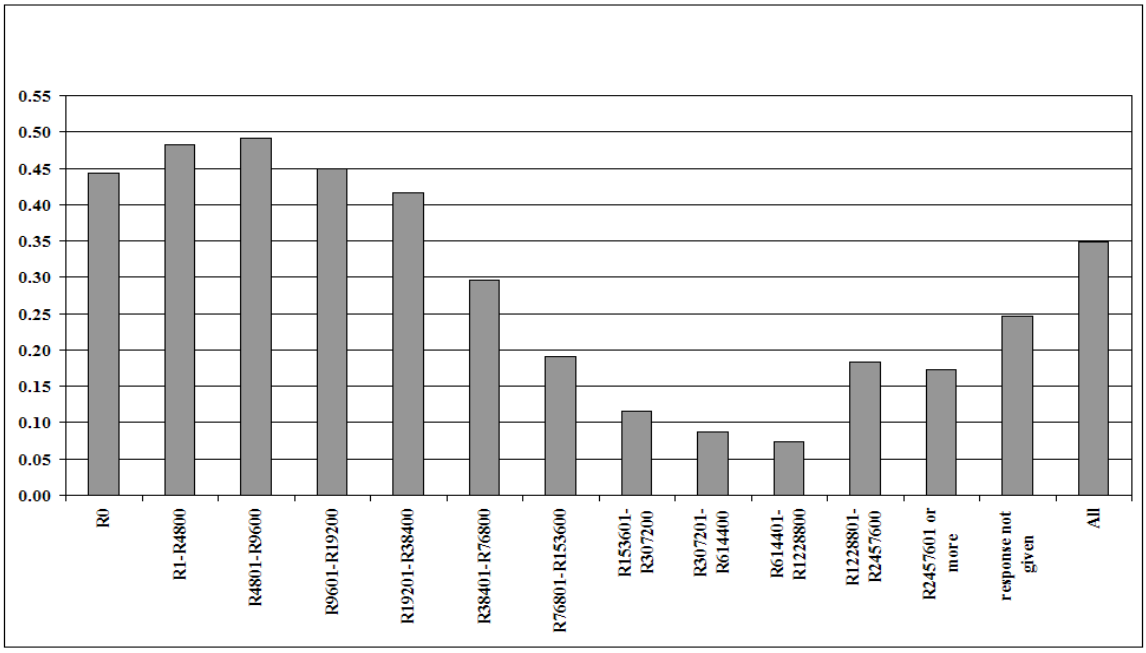


Source: Researcher's own calculations based on Census 2001 data.

Figure 5.15 below shows that the mean deprivation index is once again higher for the lower income categories, but also provides some interesting results. The mean deprivation of the R0 and R1 to R4 800 categories is actually lower than the mean deprivation in the R4 800 to R9 600 category. Thus the mean deprivation index first increases, before becoming lower as household income increases. This could be due to some of the respondents reporting R0 income when they actually might not earn zero, or it may be misreporting. Hence their non-money-metric welfare is not the worst.[46]

[46] See Appendix Table A.12. A slightly bigger proportion of households with R0 and low-income levels do have a low deprivation index. It is interesting to see that 18.5% of households with income of R0 have a deprivation index of between 0.1 and 0.2 in comparison to households with an income category of R4 801 to R9 600 only being 9.4%.

Figure 5.15: The mean deprivation index by income category, CS 2007



Source: Researcher's own calculations based on CS 2007 data.

5.3 Econometric analyses

The preceding analyses were only bivariate in nature, looking only at one variable at a time. Multivariate econometric analyses are necessary to examine whether any of the following explanatory variables listed below are more likely to be associated with higher deprivation. By doing a multivariate analysis such as this, it is possible to establish the significance of various demographic, education, location and labour status variables on deprivation.

- Gender (Reference group: Male)
- Race dummy variables (Reference group: White)
- Province dummy variables (Reference group: Western Cape)
- Age in years
- Age squared
- Educational attainment spline variables: No education to Grade 6, Grade 7 to Grade 11
- Educational attainment dummy variables: Matric, Matric plus Certificate or Diploma, Degree or above
- Household size
- Employment status dummy variable (1: Employed, 0: Not employed).

The Table 5.13 below summarises the results of the regressions for the years 1996, 2001 and 2007. All explanatory variables are found to be significant at the 1% level. The gender

variable provides some interesting results. One would expect that with the reference group being males, the coefficient for females would be positive. It is instead slightly negative. As expected, the coefficient for blacks is positive. The coefficient of the black dummy is the only positive race dummy and has the highest value. This demonstrates that blacks are most associated with higher deprivation in all three years, although they were less worse off in 2007 than in 2001 and 1996. The coefficient for blacks declines throughout the years from 0.1733 to 0.1524 and then 0.1095. This illustrates that deprivation level amongst the poorest population group has improved.

Table 5.13: Deprivation in South Africa

OLS regressions (dependent variable: deprivation index)			
	Census 1996	**Census 2001**	**CS 2007**
Variable	**Coefficient**		
Gender: Female	-0.0012	-0.0046	-0.0034
Race: Black	0.1733	0.1524	0.1095
Race: Coloured	-0.0078	-0.0052	-0.0104
Race: Indian	-0.1054	-0.0818	-0.0703
Province: Eastern Cape	0.1533	0.1444	0.1673
Province: Northern Cape	0.0293	0.0210	0.0345
Province: Free State	0.0160	0.0269	0.0072
Province: KwaZulu-Natal	0.1092	0.0903	0.1066
Province: North West	0.0586	0.0612	0.0680
Province: Gauteng	-0.0553	-0.0387	-0.0127
Province: Mpumalanga	0.0387	0.0471	0.0590
Province: Limpopo	0.1228	0.1299	0.1547
Age	-0.0039	-0.0065	-0.0065
Age-squared	0.0000	0.0000	0.0000
Education spline: Incomplete primary	-0.0162	-0.0168	-0.0172
Education spline: Incomplete secondary	-0.0258	-0.0232	-0.0223
Education: Matric	-0.0502	-0.0549	-0.0483
Education: Matric + Cert/Dip	-0.0949	-0.1027	-0.0924
Education: Degree	-0.0827	-0.0982	-0.0874
Household size	0.0029	0.0035	0.0018
Labour status: Employed	-0.1415	-0.1264	-0.1115
Labour status: Unemployed	0.0394	0.0273	0.0196
Constant	0.5778	0.6286	0.5925
R-squared	0.6617	0.6146	0.5456
Adjusted R-squared	0.6617	0.6146	0.5455
Number of observations	765 629	905 619	243 755

All statistics are significant at the 0.01 level.
Source: Researcher's own calculations based on Census 1996, Census 2001 and CS 2007 data.

The two provinces with the largest positive coefficients, indicating that households from these locations are more likely to be associated with higher deprivation, were the Eastern Cape and Limpopo. Thus deprivation is expected to be worse in these provinces and the effects are worse in 2007 for both provinces. Gauteng, on the other hand, is the only province with a

negative relation to deprivation; thus households from Gauteng are less likely to be poor than is the case for other provinces. The female variable is significant and also bears a slightly negative relation to deprivation. This was not expected, however, as females tend to be worse off than their male counterparts.

The age and education splines also have a significant and negative relation to deprivation. For each additional year of schooling the expected level of deprivation is lower. However, this effect does not continue beyond Matric plus certificate or diploma. This could be due to the quality of tertiary education received, which could affect the returns to education (Moleke 2005:12). Similarly, the older the household head, the lower the deprivation index.

Household size also plays a role and has a positive and significant relationship with deprivation. Thus the larger the household size, the higher the expected level of deprivation. This may be due to the presence of more dependants in the household. The labour status variable is also significant, with the unemployed bearing a positive relation with deprivation. This demonstrates that the unemployed have a higher expected level of deprivation than the employed. Households that have an employed head are less likely to be poor, as shown by the negative relation to the deprivation index.

5.4 A comparison between the money-metric approach and non-money-metric approach

The aim of this section is to examine the difference in results using the money-metric approach, namely a poverty line of R3 864 per annum adopted by Woolard and Leibbrandt and the non-money-metric approach using fuzzy sets. With regard to the fuzzy sets approach, no benchmark poverty line is given as to what the deprivation index should be to distinguish the poor from the non-poor. For this reason a relative poverty line needed to be determined. The relative poverty line distinguishes the poorest 40% of the population. Thus for each of the surveys, i.e. Census 1996, Census 2001 and Community Survey 2007, it was necessary to determine the deprivation index that separates the poorest 40% from the rest of the population. For 1996 this deprivation index was 0.5891, for 2001 the value was 0.5484, and for 2007 the deprivation index was 0.4129.

The following cross-tabulations illustrate the proportion of individuals characterised as poor in both the fuzzy sets approach using a relative poverty line and in the money-metric approach using the R322 per month poverty line by Woolard and Leibbrandt. The income

variable used is the post-SRMI income variable by Yu (2009), which addressed the issues of the original problematic income variable by Stats SA, such as the high proportion of zero and unspecified income households. This may provide an indication as to whether the approaches derive the percentage of the poor quite differently.

In the table below the results obtained for the Census 1996 and Census 2001 are fairly similar. Using Census 1996 and 2001, of those identified as poor in the non-money-metric fuzzy sets approach, 85% were also poor in terms of the money-metric approach. About 14% considered poor under the non-money-metric approach were considered non-poor using the money-metric approach. With respect to the Community Survey 2007, of those identified as poor under the non-money-metric approach, 69.79% were also poor in terms of the money-metric approach and 30.21% considered poor under the non-money-metric approach were considered non-poor using the money-metric approach.

Table 5.14: Proportion of the poor and non-poor using money-metric and the non-money-metric approach, 1996-2007

Census 1996		Non-money-metric approach		
		Non-poor	Poor	Total
Money-metric approach	Non-poor	61.11%	14.51%	42.48%
	Poor	38.89%	85.49%	57.52%
	Total	100.00%	100.00%	100.00%
Census 2001		Non-money-metric approach		
		Non-poor	Poor	Total
Money-metric approach	Non-poor	58.43%	14.56%	40.88%
	Poor	41.57%	85.44%	59.12%
	Total	100.00%	100.00%	100.00%
CS 2007		Non-money-metric approach		
		Non-poor	Poor	Total
Money-metric approach	Non-poor	69.44%	30.21%	53.73%
	Poor	30.56%	69.79%	46.27%
	Total	100.00%	100.00%	100.00%

Source: Researcher's own calculations based on Census 1996, Census 2001 and CS 2007 data.

The demographic characteristics of the poor are illustrated below using both approaches. The black race group is once again the dominant population group amongst the poor. This percentage is roughly 4-5% more using the fuzzy sets approach. In terms of gender, females are also a greater percentage of the poor under both approaches. The percentage increased over the years with the money-metric approach, but declined somewhat between 2001 and 2007 using the non-money-metric approach. The province variable provides some interesting results. The provinces that perform the worst with respect to both approaches are Limpopo, the Eastern Cape and KwaZulu-Natal. However, the difference between approaches for each

of the years is also greatest for these provinces. A greater percentage of the poor occurs using the non-money-metric approach. This indicates that non-income deprivation is greatest in these provinces and much can be done to alleviate poverty through service delivery. The results for educational attainment are fairly similar with low levels of education, namely that a greater proportion of the poor is reflected in both approaches.

Table 5.15: Demographic characteristics of the poor, money-metric vs. non-money-metric (fuzzy sets) approach, 1996-2007

	Money-metric approach (per capita income, 2000 prices. Poverty line: R3 864 per annum by Woolard and Leibbrandt)			**Non-money-metric approach (fuzzy sets approach. Relative poverty line: deprivation index that distinguishes the poorest 40%) Census 1996: 0.5891 Census 2001: 0.5484 CS 2007: 0.4129**		
	Census 1996	**Census 2001**	**CS 2007**	**Census 1996**	**Census 2001**	**CS 2007**
Race						
Black	92.86%	93.56%	94.40%	98.26%	98.37%	98.10%
Coloured	5.70%	5.54%	4.71%	1.36%	1.57%	1.75%
Indian	0.61%	0.52%	0.53%	0.04%	0.02%	0.08%
White	0.58%	0.37%	0.36%	0.04%	0.03%	0.07%
Unspecified	0.26%	n/a	n/a	0.31%	n/a	n/a
	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Gender						
Male	49.35%	45.31%	43.39%	47.02%	45.72%	46.89%
Female	50.65%	54.69%	56.61%	52.98%	54.28%	53.11%
	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Province						
Western Cape	4.92%	5.39%	5.48%	1.55%	2.10%	2.16%
Eastern Cape	19.68%	18.25%	17.95%	24.71%	22.50%	21.80%
Northern Cape	2.10%	1.76%	1.60%	0.75%	0.82%	0.93%
Free State	7.35%	6.80%	5.95%	4.59%	5.13%	3.90%
KwaZulu-Natal	22.50%	23.60%	23.81%	27.24%	26.31%	26.44%
North West	9.25%	8.88%	8.21%	9.13%	9.03%	8.74%
Gauteng	9.57%	12.09%	13.65%	3.99%	6.16%	7.87%
Mpumalanga	8.02%	7.80%	7.99%	6.95%	7.46%	7.81%
Limpopo	16.60%	15.43%	15.37%	21.08%	20.51%	20.35%
	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Education						
No schooling	42.08%	39.72%	27.63%	49.73%	47.74%	33.98%
Incomplete primary	23.92%	24.52%	30.07%	23.68%	24.35%	30.54%
Incomplete secondary	30.27%	29.41%	36.23%	24.17%	23.76%	30.92%
Matric	3.21%	5.29%	5.11%	2.11%	3.53%	3.69%
Matric + cert/dip	0.43%	0.87%	0.69%	0.26%	0.51%	0.54%
Degree	0.09%	0.20%	0.28%	0.04%	0.12%	0.32%
	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Source: Researcher's own calculations based on Census 1996, Census 2001 and CS 2007 data.

Probit regressions were run across the surveys to determine whether the results differ significantly using the two different approaches and which people are more likely to be poor in each survey. The Table 5.16 below summarises the results and it is possible to examine whether any of the following explanatory variables are more likely to be associated with higher deprivation when using a different approach. The derivation of the explanatory variables is the same as in Section 5.3.

The results outlined below in Table 5.16 for the years 1996, 2001 and 2007 using both money-metric and non-money-metric approaches indicate that all explanatory variables are found to be significant at the 1% level.

Table 5.16: Deprivation in South Africa using money-metric and non-money-metric approaches

Dependent variable: Poverty status (1: poor, 0: non-poor)						
	Money-metric approach			Fuzzy sets approach		
	Census 1996	**Census 2001**	**CS 2007**	**Census 1996**	**Census 2001**	**CS 2007**
Poverty line	**R3864 p/a**	**R3864 p/a**	**R3864 p/a**	**0.5891**	**0.5484**	**0.4129**
Independent variable	**Coefficient**	**Coefficient**	**Coefficient**	**Coefficient**	**Coefficient**	**Coefficient**
Gender: Female	0.2658	0.3157	0.3706	-0.0030	-0.0409	-0.0315
Race: Black	1.1442	1.3727	1.2649	1.4182	2.1670	1.9005
Race: Coloured	0.5700	0.7450	0.6966	0.2956	1.1478	0.9716
Race: Indian	0.0682	0.1801	0.3791	-1.1120	-0.3162	-0.0928
Province: Eastern Cape	0.4551	0.4261	0.4376	1.1018	1.0026	1.2479
Province: Northern Cape	0.5463	0.4197	0.3371	0.1552	0.1987	0.4432
Province: Free State	0.4469	0.3416	0.3072	0.1417	0.2232	0.2125
Province: KwaZulu-Natal	0.2382	0.2203	0.2228	0.9207	0.7120	0.9424
Province: North West	0.1554	0.1610	0.1972	0.4830	0.4854	0.6886
Province: Gauteng	-0.1829	-0.1264	0.0098	-0.3785	-0.2362	0.0468
Province: Mpumalanga	0.2342	0.1836	0.2377	0.3234	0.3786	0.6165
Province: Limpopo	0.3991	0.3804	0.4388	1.0082	1.0705	1.4120
Age in years	-0.0124	-0.0193	-0.0143	-0.0173	-0.0412	-0.0489
Age in years-squared	0.0000	0.0000	-0.0001	0.0000	0.0002	0.0003
Education spline: Incomplete primary	-0.0568	-0.0618	-0.0322	-0.0872	-0.0889	-0.0909
Education spline: Incomplete secondary	-0.1329	-0.1269	-0.1042	-0.1347	-0.1320	-0.1275
Education: Matric	-0.2533	-0.2585	-0.2524	-0.3184	-0.3070	-0.3342
Education: Matric + Cert/Dip	-0.8458	-0.7520	-0.7545	-0.7346	-0.7464	-0.7909
Education: Degree	-1.0107	-1.0274	-1.1371	-1.0981	-0.9612	-0.9412
Household size	0.1169	0.1480	0.1252	0.0141	0.0158	0.0153
Labour status: Employed	-0.6729	-0.7214	-0.6027	-0.8910	-0.7190	-0.5452
Labour status: Unemployed	0.1766	0.0708	0.3099	0.1672	0.0496	0.0576
Constant	-0.2583	-0.3348	-0.6978	-0.5192	-0.6515	-0.2372
Pseudo R-squared	0.3805	0.3968	0.3005	0.4185	0.3691	0.3581
Number of observations	33022467	42615642	46738626	33022467	42615642	46738626

All statistics are significant at the 0.01 level.
Source: Researcher's own calculations based on Census 1996, Census 2001 and CS 2007 data.

Households that are more likely to be poor irrespective of the approach being used, be it the money-metric or non-money-metric approach, are the non-white race groups with blacks having a much larger positive coefficient than the coloured or Indian race groups. This outcome is as expected, with blacks being associated with the worst levels of deprivation compared to any other race group. Those residing in provinces other than the Western Cape (reference group) or Gauteng are also more likely to be poor.

The coefficients for the various education variables across the surveys using both methods are all negative. However, low levels of education – for example, incomplete primary and incomplete secondary – have smaller negative coefficients than higher levels of education. For each additional year of schooling the expected level of deprivation is lower. Thus those with low levels of education are also more likely to be poor. Education is often seen as a means to break the cycle of poverty. Hence governments should increase efforts to improve the education system.

The labour status variable is, as expected, significant. The unemployed coefficients are positive, indicating that once again those who are unemployed have a higher expected level of deprivation. Households that have an employed head are less likely to be poor, as shown by the negative coefficient. This gives impetus to improving labour market conditions as well as addressing the structural nature of unemployment to ultimately address issues such as poverty.

The age variable indicates that, as expected, households headed by those who are either very young or old are more likely to be poor. Household size also bears a positive and significant relationship with being poor. One would expect that the larger the household size the greater the number of dependants in that household.

Gender is of particular interest. Using the money-metric approach, females were found to be more likely to be poor across all three surveys, as their significant and positive coefficients illustrate. However, using the fuzzy sets approach with the relative poverty line, the coefficients are negative. This may be an indication that the government's efforts to alleviate poverty for the most vulnerable groups are successful, as the deprivation index is more of a service delivery index, whereas the money-metric approach may reflect that women are still "money poor". Although efforts are made to improve labour market outcomes, women are

still discriminated against and have lower earnings than their male counterparts[47]. A similar result is found with the race variable, where the Indian race group has different signs for the different approaches. As expected, non-white race groups are shown to be more likely to be poor using the money metric approach, with the Indian race group having the smallest positive coefficient. However, using fuzzy sets the relation is negative. Thus the only intuitive response may be that, with respect to access to services, dwelling type and so forth, Indians are better off than the white race group.

Certain coefficients may have the same sign using both approaches, but the size of coefficients differs. This is also an interesting result. This is particularly evident in the province variables. As mentioned, the coefficients are positive for both approaches in all provinces except Gauteng, and the Western Cape, which is the reference group. For the Free State and Northern Cape the coefficients are smaller under the fuzzy sets approach. This may perhaps be an indication of good service delivery. However, for provinces such as Limpopo, the Eastern Cape and KwaZulu-Natal, households residing in these provinces are more likely to be poor under the fuzzy sets approach, as the larger coefficients illustrate. This has implications for the government's efforts to alleviate conditions for the poor through improved basic service delivery. The government's efforts would be better targeted to these provinces.

5.5 Conclusion

Chapter Five set out to critically evaluate and discuss the results of the fuzzy sets approach to poverty analyses. The chapter began by discussing poverty and deprivation in South Africa by province, race and gender. On the whole, all provinces improved in terms of the mean deprivation index across the surveys. However, the legacy of the past still persists, with Limpopo and the Eastern Cape being the worst performing provinces. Poverty still has a clear racial dimension, with blacks being the worst off. However, they did experience the highest decline in mean deprivation. Deprivation is also associated with gender, with females still being more deprived. The slightly more rapid decline of their mean deprivation index may be an indication of the effectiveness of the government's targeted efforts. The mean deprivation by employment status of the household head, the educational attainment, area type and age of head was also evaluated.

[47] See Burger and Yu (2006) as well as Woolard and Woolard (2006) for further discussion on wage trends and earnings inequality.

For a more detailed depiction of the provinces, the best and worst performing magisterial councils, municipalities and district councils were shown. Furthermore, a comparison was made between the deprivation index and the problematic household income variable. It was seen that even at R0 and low-income levels, a certain proportion of households does have a low deprivation index.

In Section 5.3 an OLS regression analysis was done. A multivariate analysis was necessary to see whether any of the explanatory variables were more likely to be associated with deprivation. Thus it was possible to determine the impact of demographic, education, location and labour status variables on deprivation. A comparison between the money-metric and non-money-metric approach was attempted in Section 5.4. A poverty line of R3 864 per annum as proposed by Woolard and Leibbrandt was used as well as a relative poverty line to distinguish the poorest 40% using the fuzzy sets approach. Probit regressions were also run to ascertain whether there is a stark difference in results when using two different approaches.

A key result to emerge is the difference in poverty trends over the 1996 – 2007 period. Most studies reviewed in Chapter Three that used the money-metric approach showed that poverty trends were upward in the 1990s, before a downward trend took place in the 2000s. This was irrespective of the survey data used. The non-money-metric poverty trends derived in this chapter, however, show a continuous downward trend over the period. The overall mean deprivation in South Africa has declined since 1996.

CHAPTER SIX: CONCLUSION

6.1 Introduction

The government has invested a great deal in improving basic service delivery. Bearing this in mind, it is expected that non-income poverty would be affected. Most studies have focused on money-metric poverty trends. Thus this thesis set out to investigate what the non-money-metric poverty trends are in South Africa since the transition. This was done using the Cheli and Lemmi (1995) fuzzy sets approach. It was thus possible to provide a description of poverty and all its dimensions.

A deprivation index was created to measure poverty in a multidimensional non-money-metric way. All the available South African census and community survey data since the transition were used to investigate the trends using the fuzzy sets approach and it was shown to what extent policy measures have been successful. This chapter mainly reviews the findings of this thesis before suggesting an overall conclusion based on the findings.

6.2 Review of findings

This thesis began by reviewing concepts and measurements of poverty in Chapter Two. The chapter defined poverty and discussed the dimensions of poverty before looking at the money-metric and non-money-metric indicators that could be used in measuring poverty. Various approaches to define the poverty line were reviewed. After that the three FGT indices were discussed as well as cumulative density functions for dominance testing. Furthermore, various advantages and disadvantages of the different measurement approaches were discussed, and it was concluded that the multidimensional non-money-metric approach is relatively better.

Chapter Three provided a literature review of recent South African studies on poverty trends since the transition using both the non-money-metric and money-metric methods. Many of the studies in South Africa adopted the money-metric approach to examine poverty trends since the transition. The money-metric approach showed that poverty worsened in 1994-2000, and only from 2000 was there a continuous downward trend in poverty.

The non-money-metric approach showed that poverty kept declining after 1994, which was to be expected because of government expenditure to ensure basic service delivery. However, some studies did not clearly indicate which non-money-metric variables were greater contributors in driving poverty down, and whether deprivation was still serious in particular provinces and areas, and for certain people. The fuzzy sets studies reviewed included the problematic income variable. By doing so, a substantial number of observations were dropped from the analysis. This thesis has attempted to address these problems.

Chapter Four began by discussing the evolution of the fuzzy sets methodology. The data used were Census 1996, 2001 and the Community Survey 2007. The horizontal and vertical weights were also derived. It was shown that the proportion of households with decent welfare in all dimensions had improved. When determining the average vertical weights, education and crowding were the greatest. Thus their horizontal weights would be small. The average vertical weights for dwelling, energy and especially the telephone variable declined over the period. For this reason, the horizontal weight for these dimensions would be greater. Individuals would naturally feel more deprived if they did not have a cellphone.

Chapter Five set out to critically evaluate and discuss the results of the fuzzy sets approach to poverty analyses. The vertical weight and horizontal weight variables were used to derive the deprivation index in order to investigate the deprivation trends in South Africa since the transition by various demographic, geographic, educational attainment and employment characteristics. It was found that the mean deprivation index was greater for households in Limpopo and the Eastern Cape, and much lower for households in the Western Cape and Gauteng. Poverty was substantially greater in more rural areas in comparison to urban areas in both 1996 and 2001. The mean deprivation in rural areas is highest in the Eastern Cape, KwaZulu-Natal and Limpopo, and lowest for the Western Cape and Gauteng.

In terms of race, blacks still have the highest mean deprivation, but experienced the biggest decline of mean deprivation between 1996 and 2007. Mean deprivation for female-headed households in South Africa was also significantly higher than for male-headed households in all three years. The least deprived provinces, namely the Western Cape and Gauteng, also have the lowest mean level of deprivation for both female- and male-headed households.

When comparing households that are either headed by an employed or unemployed person, households that have an employed head fare much better in every province across the three

surveys. Despite the high mean deprivation levels by unemployed, not economically active heads, a slight decline in overall mean deprivation is observed over the period, suggesting that poverty has been alleviated somewhat. Household heads that have attained a higher education do have lower mean deprivation levels for all provinces.

Following this, the best and worst performing magisterial districts, municipalities and district councils were discussed. A comparison was made between the deprivation index and the problematic household income variable. It was seen that even at R0 and low-income levels, a certain proportion of households do have a low deprivation index. An OLS regression analysis was done to see whether any of the explanatory variables had a significant relationship to poverty.

Section 5.4 set out to make a comparison between the money-metric and non-money-metric approach. A poverty line of R3 864 per annum as proposed by Woolard and Leibbrandt was used as well as a relative poverty line using the fuzzy sets approach. The deprivation index that separates the poorest 40% was determined for each survey. Results of the probit regressions were also of interest. Once again the black race group was associated with the worst deprivation levels, irrespective of the method used. When considering the gender variable using the money-metric approach, females were found to be more likely to be poor across all three surveys. However, when using the fuzzy sets approach with the relative poverty line, the coefficients were negative. Another interesting finding was that the size of the coefficients differed with the province variable, although the signs were the same. For the Free State and Northern Cape the coefficients are smaller in the fuzzy sets approach. This may perhaps be an indication of good service delivery. However, for provinces such as Limpopo, the Eastern Cape and KwaZulu-Natal, households residing in these provinces are more likely to be poor in the fuzzy sets approach, as the larger coefficients illustrate.

A key result to emerge is the difference in poverty trends over the period 1996-2007. Most studies reviewed in Chapter Three that used the money-metric approach showed that poverty trends were upward in the 1990s, before a downward trend took place in the 2000s. This was irrespective of the survey data used. The non-money-metric poverty trends derived in Chapter Five, however, show a continuous downward trend over the period. The overall mean deprivation in South Africa has declined since 1996.

6.3 Conclusion

The fuzzy sets approach provides a good alternative method to examine poverty from a different perspective. Poverty is a multidimensional concept and it stands to reason that all dimensions should be considered when examining poverty levels and trends in order to address the issue effectively.

Studies on poverty should capture both money-metric and non-money-metric dimensions. By excluding the household income variable, the approach is not flawless. Valid reasons were given for the exclusion of the problematic household income variable, as this would produce unreliable, incomparable and misleading results.

It may also prove beneficial for further research if Stats SA would consider adjusting the number of income intervals and width of the intervals, as well as consider some measure to address households with zero or unspecified income. If this were done, the income variable could be included without fear of affecting the reliability and comparability of the poverty estimates.

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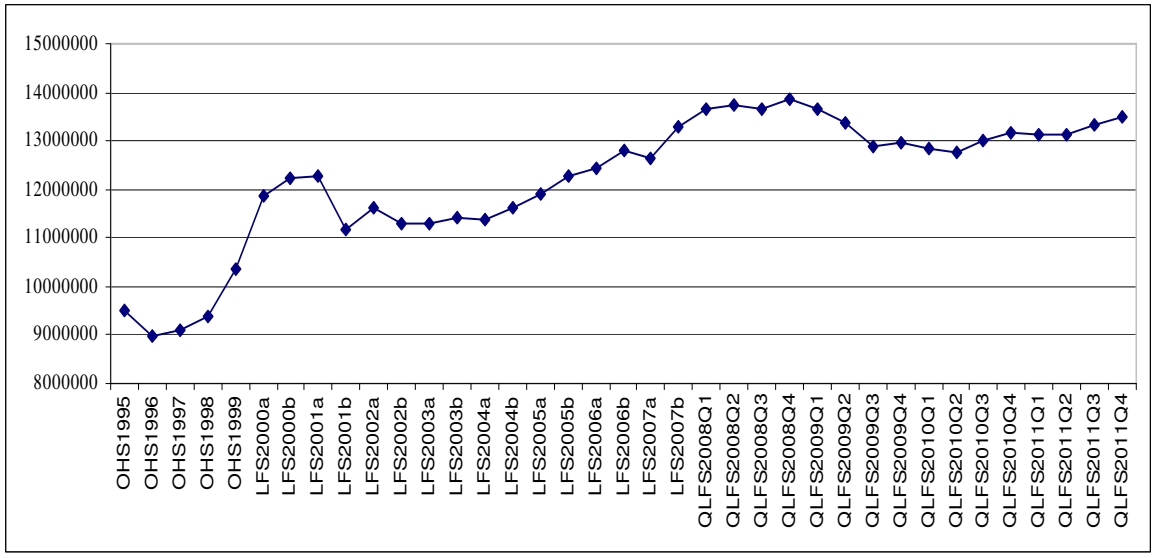
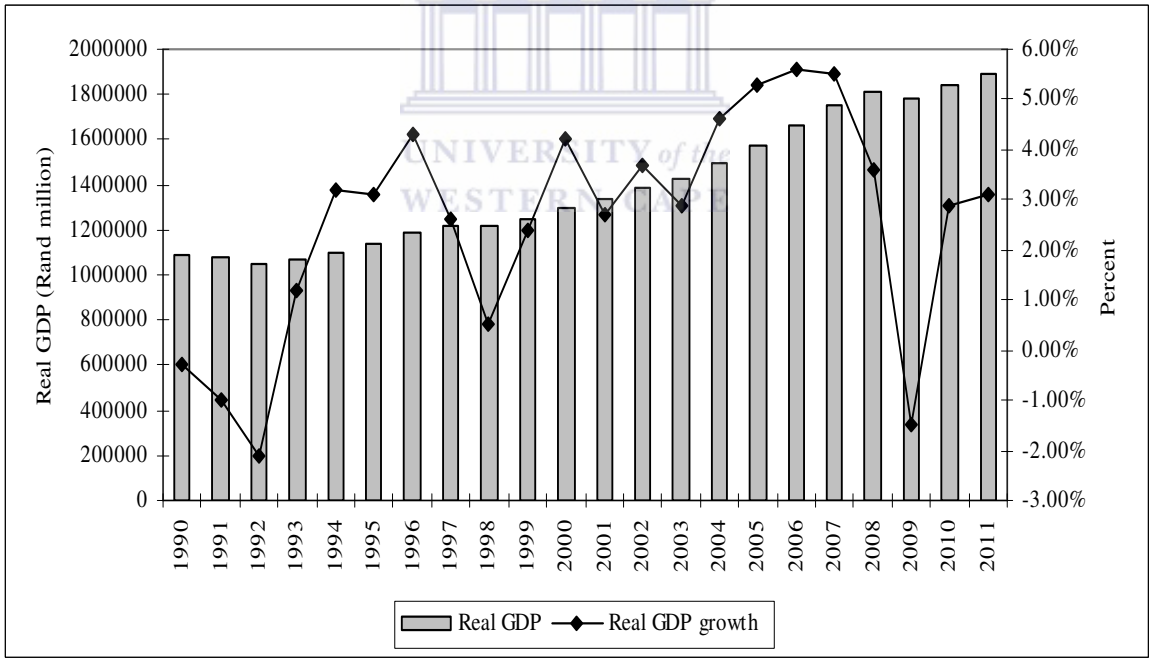
APPENDIX

Figure A.1: Number of employed, 1995 – 2011



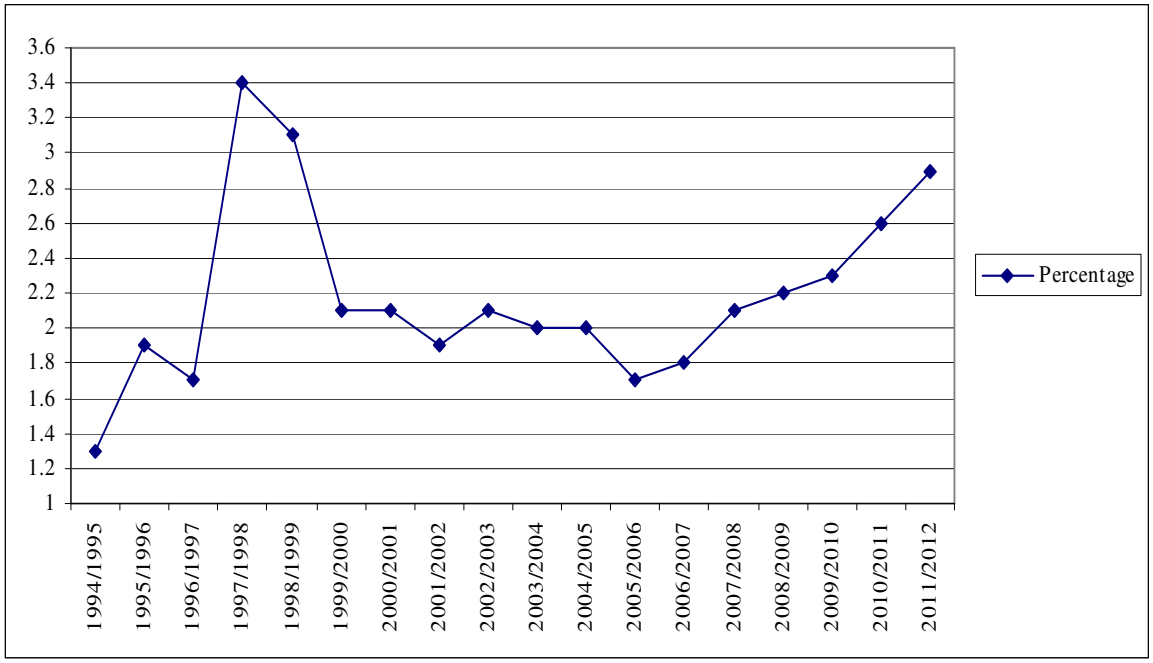
Source: Own calculations using OHS/LFS/QLFS data.

Figure A.2: Real GDP (rand million, 2000 prices) and annual real GDP growth, 1990-2011



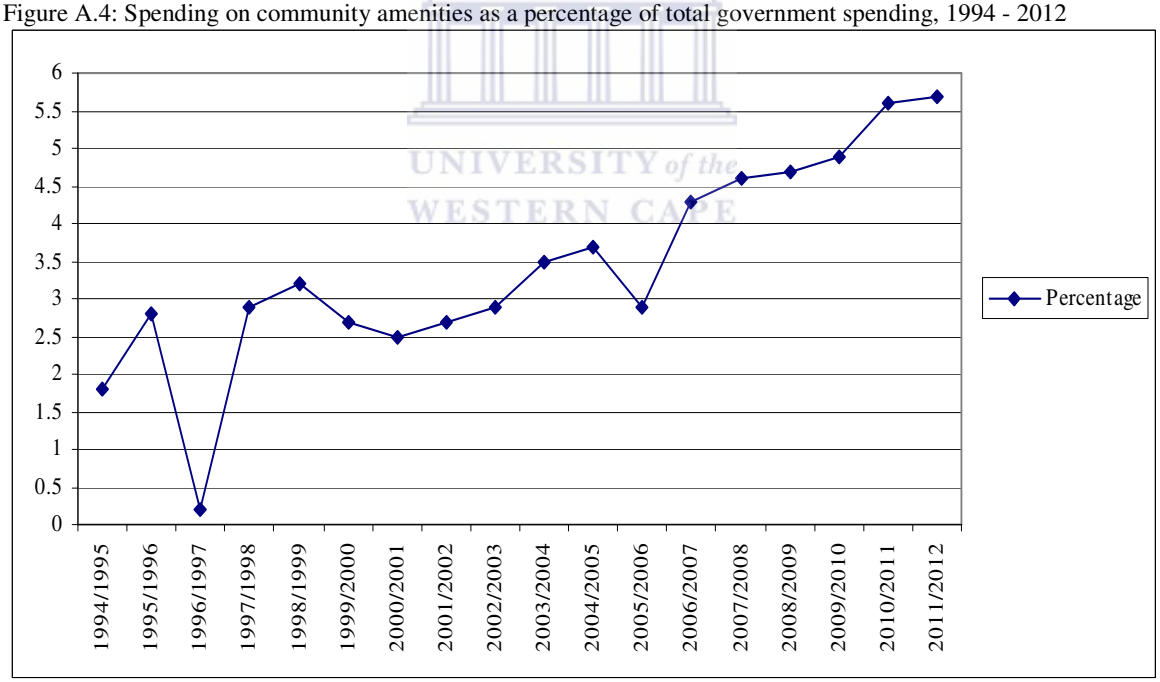
Data source: Quarterly Bulletin of Reserve Bank, various issues.

Figure A.3: Spending on housing development as a percentage of total government spending, 1994 - 2012[48]



Source: National Treasury Budget Reviews, various issues.

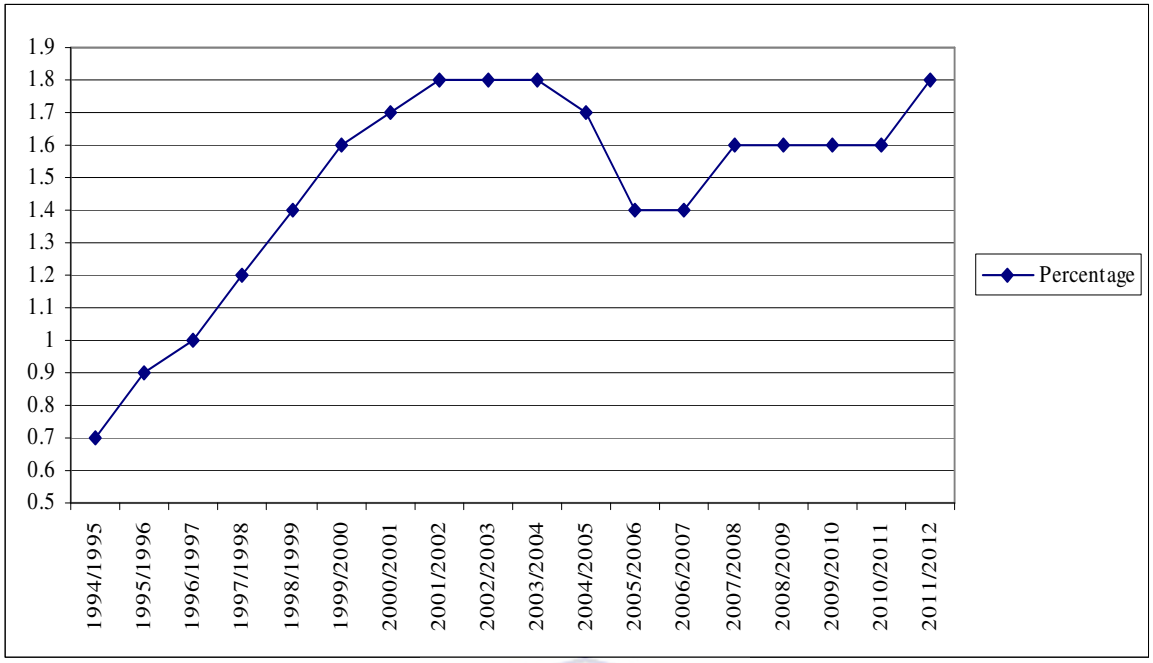
Figure A.4: Spending on community amenities as a percentage of total government spending, 1994 - 2012



Source: National Treasury Budget Reviews, various issues.

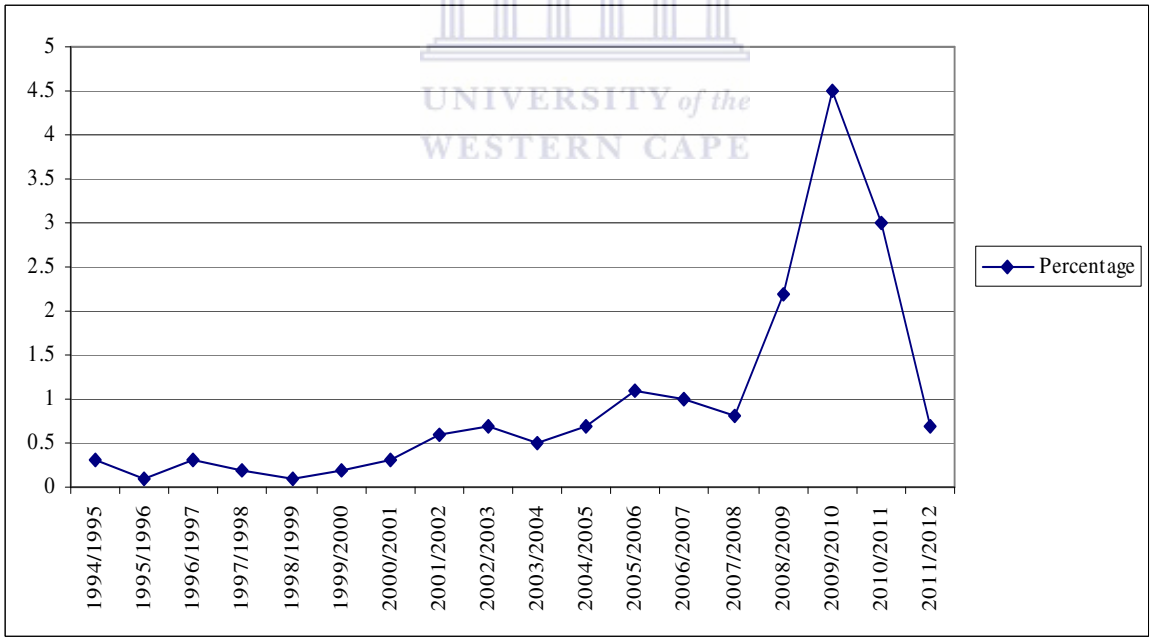
[48] The category for housing development and community amenities were grouped as one for the year 1997/1998 and 1998/1999 hence the increase in housing development for those years. Another category "Other" was given for these years, however it was not explicit as to whether it included community amenities as it did in other years.

Figure A.5: Spending on water supply as a percentage of total government spending, 1994 - 2012



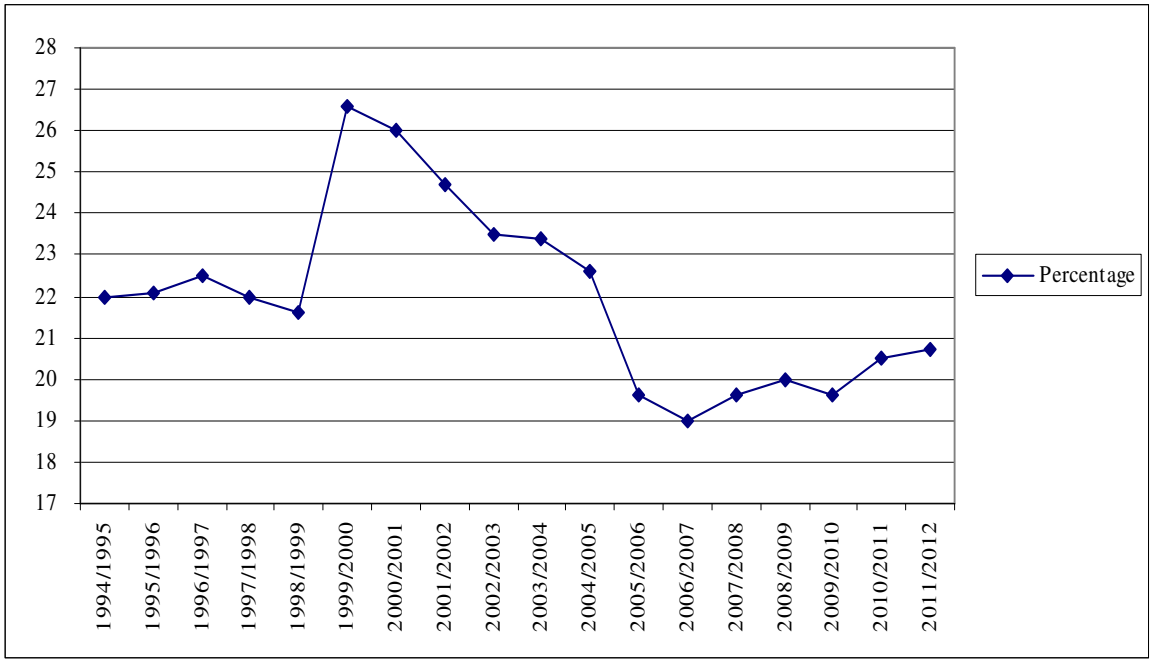
Source: National Treasury Budget Reviews, various issues.

Figure A.6: Spending on energy as a percentage of total government spending, 1994 - 2012



Source: National Treasury Budget Reviews, various issues.

Figure A.7: Spending on education as a percentage of total government spending, 1994 - 2012



Source: National Treasury Budget Reviews, various issues.

Table A.1: Monthly social grant amount by type of grant in rands (nominal price), 2005 -2010

Social grant	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Old age grant	780	820	870	940	1010	1080
War veteran grant	798	838	890	960	1030	1100
Disability grant	780	820	870	940	1010	1080
Foster care grant	560	590	620	650	680	680
Care dependency grant	780	820	870	940	1010	1080
Child support grant	180	190	200	215	240	250

Source: National Treasury Budget Reviews, various issues

Table A.2: Social grant beneficiary numbers by type of grant in each fiscal year, 2005/06-2009/10

	Number of beneficiaries				
	2005/06	**2006/07**	**2007/08**	**2008/09**	**2009/10**
Old age grant	2 144 117	2 195 018	2 218 993	2 343 995	2 534 082
War veteran grant	2 832	2 340	1 963	1 599	1 248
Disability grant	1 319 536	1 422 808	1 413 263	1 371 712	1 310 761
Foster care grant	312 614	400 503	443 191	476 394	569 215
Care dependency grant	94 263	98 631	101 836	107 065	119 307
Child support grant	7 044 901	7 863 841	8 195 524	8 765 354	9 424 281
Total	**10 918 263**	**11 983 141**	**12 374 770**	**13 066 118**	**13 958 894**

Source: National Treasury Budget Review (2010: 105)

Table A.3: Proportion of households in each ranking category, Census 1996

		Census 1996									
		WC	**EC**	**NC**	**FS**	**KZN**	**NW**	**GAU**	**MPU**	**LIM**	**RSA**
Dwelling	1: Formal house/flat	76.1%	40.5%	75.1%	56.8%	48.1%	63.3%	0.6%	59.7%	58.6%	57.2%
	2: Single room or flatlet or traditional hut	6.2%	48.5%	9.9%	15.6%	39.6%	13.3%	12.6%	23.6%	35.8%	25.5%
	3: Informal dwelling	17.8%	11.0%	15.0%	27.6%	12.4%	23.5%	26.3%	16.7%	5.6%	17.3%
Crowding	1: [0; 0.25]	7.3%	4.5%	6.4%	5.7%	4.5%	5.2%	6.4%	4.9%	3.9%	5.4%
	2: (0.25; 0.5]	20.4%	11.9%	16.2%	16.0%	13.4%	15.2%	18.9%	15.3%	12.1%	15.5%
	3: (0.5; 0.75]	14.2%	8.6%	10.9%	10.9%	10.8%	10.7%	12.8%	12.4%	10.4%	11.3%
	4: (0.75; 1]	22.7%	19.8%	20.1%	21.8%	23.4%	23.2%	25.1%	24.1%	21.6%	22.8%
	5: (1; 1.5]	13.9%	15.2%	13.8%	14.1%	15.9%	15.6%	10.7%	16.8%	18.0%	14.6%
	6: (1.5; 2]	11.2%	16.2%	14.2%	14.5%	14.8%	14.3%	13.3%	13.7%	15.9%	14.3%
	7: (2; 3]	6.7%	13.8%	10.6%	9.9%	10.5%	9.7%	7.8%	8.8%	11.9%	9.9%
	8: (3+]	3.7%	10.0%	7.8%	7.1%	6.6%	6.0%	4.9%	4.1%	6.3%	6.2%
Electricity	1. Electricity	76.6%	21.3%	52.3%	41.6%	45.1%	33.0%	72.3%	35.1%	19.2%	46.2%
	2. Gas	5.0%	3.2%	9.7%	4.1%	3.2%	4.8%	1.7%	2.5%	1.7%	3.2%
	3. Paraffin/Coal	13.8%	29.5%	19.2%	43.7%	20.8%	40.4%	25.1%	35.7%	14.7%	25.8%
	4. Wood/Dung	4.7%	45.9%	18.7%	10.7%	30.9%	21.9%	0.9%	26.8%	64.4%	24.8%
Water	1. Tap in dwelling	75.2%	22.6%	49.4%	39.7%	38.2%	28.9%	65.8%	35.9%	16.9%	42.9%
	2. Tap in premises	14.1%	10.0%	33.8%	30.6%	9.0%	20.5%	18.7%	26.2%	17.9%	16.9%
	3. Public tap	7.9%	18.1%	8.3%	24.3%	18.9%	32.2%	12.1%	20.4%	40.9%	19.9%
	4. Other	2.8%	49.4%	8.6%	5.5%	33.9%	18.4%	3.4%	17.5%	24.3%	20.3%
Sanitation	1: Toilet facility	85.7%	28.5%	59.4%	44.8%	40.8%	31.2%	82.5%	37.2%	12.6%	49.2%
	2: Pit latrine	4.9%	35.5%	11.5%	25.3%	42.8%	55.7%	12.3%	50.4%	65.8%	33.4%
	3. Bucket latrine	3.9%	5.9%	18.2%	21.1%	0.9%	6.6%	2.6%	3.7%	0.5%	4.8%
	4. Other	5.5%	30.2%	10.9%	8.8%	15.4%	6.5%	2.6%	8.7%	21.2%	12.6%
Refuse removal	1: Removed once a week	83.1%	31.7%	68.5%	61.1%	41.7%	34.3%	82.2%	37.4%	10.9%	51.0%
	2: Removed less often	2.6%	1.7%	2.1%	4.2%	1.2%	1.5%	3.9%	1.9%	0.8%	2.3%
	3: Communal refuse dump	4.0%	1.7%	5.0%	4.4%	2.9%	4.0%	3.5%	3.3%	0.0%	3.3%
	4: Own refuse dump	8.1%	41.9%	19.8%	24.6%	42.1%	52.8%	7.6%	48.3%	67.9%	33.5%
	5: Other	2.2%	23.1%	4.5%	5.8%	12.0%	7.4%	2.8%	9.1%	17.5%	10.0%
Telephone	1: Landline telephone or cellphone	54.7%	13.8%	30.1%	22.2%	25.9%	16.1%	43.5%	17.5%	7.0%	27.4%
	2: None of both	45.4%	86.2%	69.9%	77.8%	74.1%	84.0%	56.5%	82.5%	93.0%	72.6%
Education of household head	1. Above Matric	13.6%	5.2%	7.1%	6.5%	6.2%	5.2%	10.7%	6.0%	4.7%	7.6%
	2: Matric	16.1%	7.5%	9.8%	11.5%	11.4%	9.6%	19.9%	10.2%	8.9%	12.6%
	3: Incomplete secondary	46.5%	37.9%	36.5%	39.4%	34.9%	36.3%	45.5%	31.6%	28.0%	38.3%
	4: Incomplete primary	16.1%	23.3%	20.7%	22.6%	18.9%	20.6%	12.6%	15.5%	13.2%	17.5%
	5: No schooling	7.7%	26.1%	26.0%	20.0%	28.7%	28.3%	11.4%	36.7%	45.1%	24.0%
Labour market status of household head	1. 15-65 years, employed	66.9%	29.6%	58.6%	55.6%	46.4%	49.8%	66.9%	54.2%	31.5%	50.6%
	2. 15-65 years, inactive OR not 15-65 years	25.9%	53.0%	32.8%	29.5%	39.0%	34.2%	19.9%	31.9%	49.9%	35.1%
	3. 15-65 years, unemployed	7.2%	17.4%	8.7%	14.9%	14.6%	16.0%	13.2%	13.9%	18.6%	14.3%

Source: Researcher's own calculations based on Census 1996 data.

Table A.4: Proportion of households in each ranking category, Census 2001

		Census 2001									
		WC	**EC**	**NC**	**FS**	**KZN**	**NW**	**GAU**	**MPU**	**LIM**	**RSA**
Dwelling	1: Formal house/flat	78.3%	47.4%	80.3%	62.4%	56.7%	68.7%	65.4%	67.2%	70.7%	63.7%
	2: Single room or flatlet or traditional hut	5.4%	41.5%	6.9%	11.1%	32.3%	9.0%	10.5%	16.8%	22.7%	19.7%
	3: Informal dwelling	16.4%	11.1%	12.8%	26.5%	11.0%	22.4%	24.1%	16.0%	6.6%	16.5%
Crowding	1: [0; 0.25]	7.3%	5.9%	7.2%	6.3%	6.5%	8.0%	7.3%	5.8%	5.0%	6.6%
	2: (0.25; 0.5]	19.9%	14.5%	18.1%	17.1%	15.6%	18.2%	19.8%	16.8%	13.3%	17.1%
	3: (0.5; 0.75]	13.7%	10.4%	12.5%	11.6%	10.9%	11.7%	12.5%	12.7%	11.3%	11.8%
	4: (0.75; 1]	22.3%	21.2%	21.1%	23.4%	24.4%	24.0%	26.0%	24.6%	23.6%	23.9%
	5: (1; 1.5]	13.6%	15.1%	14.5%	14.7%	14.6%	14.2%	10.5%	16.0%	16.2%	13.8%
	6: (1.5; 2]	11.5%	14.8%	12.8%	13.8%	13.9%	12.3%	13.0%	12.9%	15.0%	13.4%
	7: (2; 3]	7.1%	10.8%	8.4%	8.4%	8.7%	7.5%	7.0%	7.4%	10.0%	8.3%
	8: (3+]	4.7%	7.2%	5.6%	4.8%	5.5%	4.2%	4.0%	3.8%	5.7%	5.0%
Electricity	1. Electricity	79.0%	28.1%	59.0%	47.1%	48.7%	44.5%	73.2%	40.0%	25.1%	51.5%
	2. Gas	3.4%	2.9%	6.6%	3.4%	3.0%	2.9%	1.5%	1.9%	1.7%	2.6%
	3. Paraffin/Coal	14.3%	29.8%	18.4%	39.6%	20.2%	33.3%	24.3%	33.5%	12.7%	24.2%
	4. Wood/Dung	3.4%	39.2%	16.0%	9.9%	28.2%	19.3%	1.1%	24.6%	60.5%	21.7%
Water	1. Tap in dwelling	67.3%	17.9%	39.4%	22.7%	29.6%	18.1%	47.1%	21.2%	9.4%	32.2%
	2. Tap in premises	17.8%	19.4%	42.0%	47.4%	19.9%	34.6%	36.3%	37.7%	28.8%	29.0%
	3. Public tap	13.2%	25.5%	15.1%	25.4%	23.8%	33.5%	14.0%	27.7%	39.7%	23.3%
	4. Other	1.8%	37.3%	3.5%	4.5%	26.6%	13.8%	2.6%	13.4%	22.1%	15.5%
Sanitation	1: Toilet facility	86.4%	35.0%	66.5%	46.7%	47.1%	35.8%	82.7%	39.5%	17.4%	53.7%
	2: Pit latrine	2.1%	28.6%	10.1%	22.9%	35.7%	50.2%	11.4%	47.3%	58.7%	28.6%
	3. Bucket latrine	3.7%	5.7%	11.9%	20.4%	1.1%	4.5%	2.3%	2.8%	0.6%	4.1%
	4. Other	7.8%	30.8%	11.4%	10.0%	16.1%	9.6%	3.7%	10.3%	23.4%	13.6%
Refuse removal	1: Removed once a week	87.9%	37.2%	68.5%	58.0%	49.4%	36.2%	84.1%	38.3%	14.1%	55.3%
	2: Removed less often	1.0%	1.4%	3.1%	3.2%	1.1%	1.0%	2.2%	1.7%	0.7%	1.5%
	3: Communal refuse dump	2.2%	1.2%	2.6%	3.6%	0.8%	1.9%	2.3%	1.7%	1.0%	1.8%
	4: Own refuse dump	7.4%	43.5%	22.1%	25.5%	38.4%	52.4%	8.7%	48.1%	68.4%	32.7%
	5: Other	1.5%	16.8%	3.7%	9.7%	10.3%	8.5%	2.6%	10.2%	15.8%	8.7%
Telephone	1: Landline telephone or cellphone	63.0%	29.0%	41.3%	35.1%	38.8%	34.4%	56.0%	38.2%	28.2%	42.4%
	2: None of both	37.0%	71.1%	58.8%	64.9%	61.2%	65.6%	44.0%	61.8%	71.8%	57.6%
Education of household head	1. Above Matric	13.3%	6.4%	6.3%	6.3%	7.3%	5.7%	13.3%	6.2%	6.5%	8.8%
	2: Matric	20.6%	10.4%	13.1%	13.5%	14.3%	13.2%	23.5%	13.4%	10.1%	15.9%
	3: Incomplete secondary	43.2%	33.7%	35.7%	36.5%	31.7%	34.3%	39.7%	29.5%	27.8%	35.1%
	4: Incomplete primary	16.5%	21.5%	22.5%	24.2%	19.3%	22.3%	13.4%	17.2%	15.8%	18.0%
	5: No schooling	6.5%	28.1%	22.4%	19.5%	27.5%	24.5%	10.1%	33.8%	39.9%	22.1%
Labour market status of household head	1. 15-65 years, employed	58.6%	27.8%	51.0%	45.2%	39.1%	42.5%	58.1%	45.5%	29.9%	44.5%
	2. 15-65 years, inactive OR not 15-65 years	29.1%	52.9%	36.1%	33.5%	41.1%	38.7%	22.3%	35.7%	51.0%	36.9%
	3. 15-65 years, unemployed	12.4%	19.3%	12.9%	21.4%	19.8%	18.8%	19.6%	18.9%	19.1%	18.7%

Source: Researcher's own calculations based on Census 2001 data.

Table A.5: Proportion of households in each ranking category, CS 2007

		Community Survey 2007									
		WC	**EC**	**NC**	**FS**	**KZN**	**NW**	**GAU**	**MPU**	**LIM**	**RSA**
Dwelling	1: Formal house/flat	81.9%	51.3%	79.6%	68.3%	57.9%	66.2%	65.3%	72.0%	82.0%	66.7%
	2: Single room or flatlet or traditional hut	2.4%	40.3%	4.4%	7.3%	29.9%	6.5%	7.7%	10.4%	10.9%	15.6%
	3: Informal dwelling	15.7%	8.4%	16.0%	24.4%	12.2%	27.3%	27.0%	17.6%	7.0%	17.7%
Crowding	1: [0; 0.25]	6.2%	6.2%	7.7%	7.4%	4.8%	6.6%	6.0%	5.8%	5.8%	6.0%
	2: (0.25; 0.5]	19.9%	16.5%	19.2%	21.3%	14.6%	17.9%	19.8%	18.7%	16.1%	17.9%
	3: (0.5; 0.75]	13.8%	12.1%	12.8%	13.6%	11.4%	11.4%	13.0%	13.2%	12.8%	12.6%
	4: (0.75; 1]	21.1%	21.7%	22.7%	23.4%	24.5%	26.5%	25.4%	25.3%	24.5%	24.1%
	5: (1; 1.5]	12.8%	15.0%	14.0%	13.0%	15.3%	13.3%	11.2%	15.0%	15.4%	13.6%
	6: (1.5; 2]	12.1%	13.3%	11.8%	11.0%	14.0%	12.3%	12.8%	12.0%	12.9%	12.8%
	7: (2; 3]	7.6%	9.1%	7.7%	6.4%	9.2%	7.4%	7.1%	6.9%	8.3%	7.9%
	8: (3+]	6.5%	6.2%	4.3%	3.9%	6.2%	4.8%	4.6%	3.2%	4.2%	5.1%
Electricity	1. Electricity	88.8%	44.7%	81.0%	75.3%	61.9%	64.9%	81.7%	57.8%	40.1%	66.5%
	2. Gas	4.1%	2.8%	3.6%	2.2%	2.4%	1.9%	0.9%	1.3%	1.0%	2.0%
	3. Paraffin/Coal	6.2%	23.3%	8.0%	18.7%	14.1%	22.1%	16.9%	23.8%	8.2%	16.0%
	4. Wood/Dung	0.9%	29.2%	7.4%	3.9%	21.7%	11.2%	0.5%	17.1%	50.7%	15.5%
Water	1. Tap in dwelling	79.5%	29.3%	55.6%	46.3%	40.2%	32.4%	66.5%	37.5%	17.5%	47.2%
	2. Tap in premises	11.6%	13.7%	32.5%	40.6%	19.3%	29.7%	21.1%	34.8%	25.2%	22.3%
	3. Public tap	7.8%	27.1%	6.9%	10.5%	20.8%	27.3%	10.6%	17.7%	42.3%	19.2%
	4. Other	1.1%	29.9%	5.0%	2.7%	19.8%	10.5%	1.8%	10.0%	15.1%	11.3%
Sanitation	1: Toilet facility	92.5%	37.6%	75.0%	60.7%	46.0%	43.9%	85.3%	44.2%	18.5%	58.2%
	2: Pit latrine	1.4%	36.6%	14.0%	23.5%	43.1%	46.4%	12.1%	48.7%	68.5%	31.4%
	3. Bucket latrine	2.4%	2.7%	5.0%	12.6%	0.5%	3.7%	1.0%	0.5%	0.0%	2.2%
	4. Other	3.8%	23.1%	6.0%	3.2%	10.4%	5.9%	1.6%	6.6%	13.0%	8.2%
Refuse removal	1: Removed once a week	90.1%	36.2%	77.7%	74.5%	51.4%	49.0%	85.9%	43.5%	16.6%	59.9%
	2: Removed less often	1.0%	3.0%	2.5%	1.7%	1.5%	1.9%	1.4%	2.1%	1.0%	1.7%
	3: Communal refuse dump	4.0%	1.4%	1.5%	1.7%	1.8%	1.4%	2.5%	3.0%	1.2%	2.2%
	4: Own refuse dump	3.5%	45.6%	15.4%	16.8%	35.9%	39.1%	6.3%	44.8%	68.0%	28.8%
	5: Other	1.4%	13.9%	2.9%	5.4%	9.3%	8.5%	3.8%	6.5%	13.2%	7.4%
Telephone	1: Landline telephone or cellphone	83.6%	63.9%	67.8%	71.4%	76.1%	73.1%	83.6%	79.6%	71.1%	76.2%
	2: None of both	16.4%	36.1%	32.2%	28.6%	23.9%	26.9%	16.4%	20.4%	29.0%	23.8%
Education of household head	1. Above Matric	14.9%	7.0%	7.6%	7.9%	8.1%	6.3%	14.8%	7.7%	6.9%	10.0%
	2: Matric	17.5%	8.9%	13.8%	12.7%	13.4%	11.5%	20.5%	13.2%	9.0%	14.4%
	3: Incomplete secondary	47.5%	41.3%	39.6%	41.7%	37.6%	38.7%	44.8%	36.4%	35.9%	41.1%
	4: Incomplete primary	15.9%	25.8%	22.3%	26.1%	21.9%	25.0%	14.1%	20.0%	19.9%	20.0%
	5: No schooling	4.2%	17.1%	16.6%	11.6%	19.1%	18.5%	6.0%	22.9%	28.4%	14.6%
Labour market status of household head	1. 15-65 years, employed	62.9%	36.6%	53.5%	53.8%	47.9%	50.3%	65.4%	57.5%	37.1%	52.7%
	2. 15-65 years, inactive OR not 15-65 years	28.4%	51.6%	38.0%	33.5%	40.9%	37.8%	21.6%	31.4%	49.6%	35.6%
	3. 15-65 years, unemployed	8.7%	11.9%	8.5%	12.7%	11.2%	11.8%	13.0%	11.1%	13.4%	11.8%

Source: Researcher's own calculations based on CS 2007 data.

Table A.6: Average vertical weight in each dimension, 1996-2007

	Census 1996									
	WC	**EC**	**NC**	**FS**	**KZN**	**NW**	**GAU**	**MPU**	**LIM**	**RSA**
Dwelling	0.2143	0.3994	0.2090	0.3686	0.3595	0.3137	0.3383	0.3077	0.2694	0.3252
Crowding	0.4786	0.6142	0.5516	0.5511	0.5705	0.5528	0.5038	0.5369	0.5906	0.5494
Energy	0.1241	0.6204	0.2964	0.3446	0.4225	0.4388	0.1457	0.4614	0.7245	0.3890
Water	0.1208	0.6396	0.2389	0.3019	0.4872	0.4520	0.1671	0.3840	0.5599	0.3814
Sanitation	0.1169	0.5792	0.3211	0.4131	0.4428	0.4807	0.1268	0.4460	0.6476	0.3817
Refuse	0.0919	0.5670	0.2099	0.2605	0.4592	0.4992	0.0939	0.4795	0.7186	0.3715
Telephone	0.4535	0.8622	0.6990	0.7779	0.7410	0.8395	0.5651	0.8250	0.9298	0.7264
Education	0.4739	0.6526	0.6269	0.5997	0.6338	0.6484	0.4845	0.6693	0.7156	0.5978
Employment	0.2561	0.5502	0.3196	0.3585	0.4231	0.4031	0.2732	0.3654	0.5402	0.3920
	Census 2001									
	WC	**EC**	**NC**	**FS**	**KZN**	**NW**	**GAU**	**MPU**	**LIM**	**RSA**
Dwelling	0.1928	0.3365	0.1657	0.3249	0.2859	0.2721	0.2984	0.2514	0.1898	0.2726
Crowding	0.5137	0.5880	0.5387	0.5496	0.5603	0.5238	0.5135	0.5421	0.5874	0.5456
Energy	0.1145	0.5584	0.2651	0.3198	0.3945	0.3789	0.1455	0.4321	0.6758	0.3522
Water	0.1951	0.6526	0.3309	0.4440	0.5354	0.5450	0.2890	0.5089	0.6509	0.4589
Sanitation	0.1175	0.5242	0.2609	0.3856	0.3894	0.4370	0.1230	0.4154	0.6000	0.3415
Refuse	0.0764	0.5190	0.2183	0.3060	0.4130	0.5085	0.0992	0.4917	0.7100	0.3520
Telephone	0.3697	0.7105	0.5875	0.6494	0.6117	0.6558	0.4396	0.6183	0.7176	0.5764
Education	0.4673	0.6500	0.6174	0.6062	0.6234	0.6289	0.4655	0.6564	0.6914	0.5819
Employment	0.3167	0.5442	0.3689	0.4361	0.4711	0.4449	0.3441	0.4257	0.5296	0.4316
	CS 2007									
	WC	**EC**	**NC**	**FS**	**KZN**	**NW**	**GAU**	**MPU**	**LIM**	**RSA**
Dwelling	0.1685	0.2727	0.1808	0.2786	0.2622	0.3033	0.3062	0.2252	0.1215	0.2500
Crowding	0.5389	0.5680	0.5284	0.5092	0.5880	0.5441	0.5327	0.5346	0.5579	0.5497
Energy	0.0449	0.4189	0.1192	0.1405	0.2937	0.2312	0.0961	0.2996	0.5514	0.2424
Water	0.1210	0.5699	0.2413	0.2807	0.4428	0.4454	0.1904	0.3861	0.5895	0.3583
Sanitation	0.0671	0.5273	0.2048	0.3099	0.4318	0.4376	0.1148	0.4354	0.6444	0.3359
Refuse	0.0468	0.5130	0.1567	0.1929	0.3881	0.4057	0.0924	0.4336	0.6875	0.3119
Telephone	0.1637	0.3612	0.3222	0.2863	0.2390	0.2694	0.1638	0.2038	0.2895	0.2376
Education	0.4964	0.6553	0.6192	0.6119	0.6270	0.6513	0.4858	0.6409	0.6859	0.5890
Employment	0.3002	0.5059	0.3702	0.3788	0.4196	0.4025	0.2920	0.3470	0.5059	0.3848

Source: Researcher's own calculations based on Census 1996, Census 2001 and CS 2007 data.

Table A.7: Mean deprivation by magisterial district, Census 1996 and Census 2001

Province	Code	Magisterial District (MD) name	1996	2001	Difference
WC	101	Bellville	0.119	0.148	0.030
WC	102	Goodwood	0.179	0.187	0.008
WC	103	Cape	0.120	0.142	0.022
WC	104	Simonstown	0.160	0.167	0.007
WC	105	Wynberg	0.138	0.132	-0.006
WC	106	Mitchellsplain	0.323	0.273	-0.050
WC	107	Kuilsrivier	0.193	0.247	0.054
WC	108	Paarl	0.238	0.246	0.007
WC	109	Stellenbosch	0.198	0.212	0.014
WC	110	Somerset West	0.164	0.225	0.061
WC	111	Strand	0.193	0.248	0.055
WC	112	Wellington	0.221	0.311	0.090
WC	113	Bredasdorp	0.237	0.221	-0.016
WC	114	Caledon	0.251	0.263	0.012
WC	115	Hermanus	0.226	0.212	-0.014
WC	116	Heidelberg	0.320	0.261	-0.058
WC	117	Swellendam	0.297	0.271	-0.027
WC	118	George	0.257	0.258	0.001
WC	119	Knysna	0.329	0.292	-0.037
WC	120	Mossel bay	0.235	0.226	-0.009
WC	121	Riversdal	0.303	0.254	-0.049
WC	122	Calitzdorp	0.374	0.352	-0.022
WC	123	Ladismith	0.356	0.304	-0.052
WC	124	Oudtshoorn	0.285	0.292	0.007
WC	125	Uniondale	0.429	0.381	-0.048
WC	126	Ceres	0.264	0.252	-0.012
WC	127	Montagu	0.281	0.268	-0.013
WC	128	Robertson	0.275	0.263	-0.012
WC	129	Tulbagh	0.270	0.266	-0.004
WC	130	Worcester	0.226	0.243	0.018
WC	131	Hopefield	0.197	0.170	-0.027
WC	132	Malmesbury	0.209	0.212	0.002
WC	133	Piketberg	0.253	0.250	-0.003
WC	134	Vredenburg	0.186	0.194	0.009
WC	135	Moorreesburg	0.217	0.211	-0.006
WC	136	Clanwilliam	0.262	0.275	0.014
WC	137	Van Rhynsdorp	0.314	0.269	-0.045
WC	138	Vredendal	0.275	0.276	0.001
WC	139	Beaufort West	0.263	0.249	-0.014
WC	140	Laingsburg	0.339	0.325	-0.013
WC	141	Murraysburg	0.445	0.368	-0.077
WC	142	Prince Albert	0.379	0.312	-0.066
EC	201	Albert	0.461	0.400	-0.061
EC	202	Aliwal North	0.407	0.431	0.025
EC	203	Lady Grey	0.482	0.507	0.026
EC	204	Steynsburg	0.452	0.439	-0.012
EC	205	Venterstad	0.471	0.415	-0.056
EC	206	Hofmeyer	0.473	0.540	0.067
EC	207	Barkley-East	0.577	0.496	-0.081
EC	208	Elliot	0.485	0.476	-0.009
EC	209	Indwe	0.528	0.526	-0.002
EC	210	Maclear	0.568	0.523	-0.045

Table A.7: Continued

Province	Code	Magisterial District (MD) name	1996	2001	Difference
EC	211	Wodehouse	0.518	0.515	-0.003
EC	212	Cathcart	0.432	0.448	0.016
EC	213	Komga	0.606	0.575	-0.032
EC	214	Molteno	0.446	0.409	-0.037
EC	215	Queenstown	0.403	0.348	-0.055
EC	216	Sterkstroom	0.449	0.423	-0.027
EC	217	Stutterheim	0.570	0.550	-0.020
EC	218	Tarka	0.469	0.463	-0.006
EC	219	East-London	0.431	0.408	-0.023
EC	220	King William's Town	0.228	0.404	0.176
EC	221	Albany	0.392	0.398	0.006
EC	222	Alexandria	0.481	0.464	-0.017
EC	223	Adelaide	0.456	0.437	-0.019
EC	224	Bathurst	0.486	0.422	-0.064
EC	225	Bedford	0.480	0.464	-0.016
EC	226	Fort Beaufort	0.441	0.454	0.012
EC	227	Somerset East	0.403	0.379	-0.024
EC	228	Kirkwood	0.448	0.463	0.015
EC	229	Cradock	0.376	0.316	-0.060
EC	230	Middelburg	0.269	0.267	-0.002
EC	231	Aberdeen	0.393	0.380	-0.013
EC	232	Graaff-Reinet	0.336	0.299	-0.037
EC	233	Pearston	0.449	0.433	-0.015
EC	234	Jansenville	0.419	0.398	-0.021
EC	235	Steytlerville	0.414	0.399	-0.015
EC	236	Willowmore	0.450	0.389	-0.061
EC	237	Hankey	0.429	0.429	0.000
EC	238	Humansdorp	0.349	0.288	-0.061
EC	239	Joubertina	0.363	0.343	-0.021
EC	240	Port Elizabeth	0.262	0.277	0.015
EC	241	Uitenhage	0.280	0.295	0.014
EC	242	Mdantsane	0.367	0.372	0.005
EC	243	Zwelitsha	0.561	0.486	-0.075
EC	244	Hewu	0.533	0.552	0.019
EC	245	Keiskammahoek	0.714	0.624	-0.089
EC	246	Mpofu	0.748	0.682	-0.066
EC	247	Victoria East	0.626	0.560	-0.066
EC	248	Middeldrift	0.673	0.627	-0.045
EC	249	Peddie	0.697	0.650	-0.047
EC	250	Bizana	0.769	0.734	-0.035
EC	251	Butterworth	0.578	0.543	-0.035
EC	252	Elliotdale	0.853	0.819	-0.034
EC	253	Engcobo	0.809	0.771	-0.039
EC	254	Flagstaff	0.788	0.756	-0.032
EC	255	Idutywa	0.800	0.745	-0.055
EC	256	Kentani	0.817	0.790	-0.028
EC	257	Libode	0.785	0.747	-0.038
EC	258	Lusikisiki	0.792	0.766	-0.026
EC	259	Maluti	0.748	0.700	-0.048
EC	260	Mt Ayliff	0.774	0.721	-0.053
EC	261	Mt Fletcher	0.776	0.745	-0.032
EC	262	Mt Frere	0.747	0.709	-0.038

Table A.7: Continued

Province	Code	Magisterial District (MD) name	1996	2001	Difference
EC	263	Mqanduli	0.831	0.787	-0.044
EC	264	Ngqueleni	0.804	0.769	-0.036
EC	265	Nqamakwe	0.769	0.732	-0.037
EC	266	Port St Johns	0.818	0.771	-0.046
EC	267	Qumbu	0.764	0.734	-0.030
EC	268	Cofimvaba	0.773	0.745	-0.028
EC	269	Tabankulu	0.831	0.782	-0.049
EC	270	Tsolo	0.761	0.729	-0.032
EC	271	Tsomo	0.780	0.727	-0.053
EC	272	Umtata	0.633	0.585	-0.048
EC	273	Willowvale	0.816	0.787	-0.029
EC	274	Cala	0.711	0.666	-0.046
EC	275	Lady Frere	0.661	0.708	0.047
EC	276	Sterkspruit	0.700	0.647	-0.053
EC	277	Umzimkulu	0.756	0.707	-0.049
EC	278	Ntabathemba	0.667	0.626	-0.041
NC	301	Namakwaland	0.305	0.275	-0.030
NC	302	Calvinia	0.337	0.318	-0.018
NC	303	Sutherland	0.377	0.387	0.010
NC	304	Williston	0.344	0.308	-0.036
NC	305	Carnarvon	0.418	0.403	-0.015
NC	306	Prieska	0.343	0.326	-0.017
NC	307	Britstown	0.422	0.398	-0.023
NC	308	Colesberg	0.413	0.417	0.004
NC	309	De Aar	0.288	0.258	-0.030
NC	310	Hanover	0.429	0.388	-0.041
NC	311	Hopetown	0.365	0.351	-0.014
NC	312	Noupoort	0.314	0.316	0.002
NC	313	Philipstown	0.397	0.342	-0.055
NC	314	Richmond	0.380	0.325	-0.056
NC	315	Gordonia	0.347	0.352	0.005
NC	316	Kenhardt	0.388	0.303	-0.086
NC	317	Barkley-West	0.497	0.432	-0.064
NC	318	Hartswater	0.405	0.404	0.000
NC	319	Herbert	0.432	0.537	0.105
NC	320	Warrenton	0.408	0.387	-0.022
NC	321	Kimberley	0.260	0.273	0.013
NC	322	Kuruman	0.377	0.409	0.032
NC	323	Postmasburg	0.303	0.275	-0.028
NC	324	Hay	0.451	0.423	-0.028
NC	325	Fraserburg	0.402	0.367	-0.035
NC	326	Victoria-West	0.387	0.374	-0.013
FS	401	Boshof	0.461	0.459	-0.002
FS	402	Jacobsdal	0.404	0.436	0.032
FS	403	Koffiefontein	0.290	0.279	-0.011
FS	404	Fauresmith	0.378	0.391	0.013
FS	405	Petrusburg	0.411	0.442	0.030
FS	406	Odendaalsrus	0.390	0.399	0.009
FS	407	Virginia	0.347	0.391	0.043
FS	408	Welkom	0.286	0.363	0.077
FS	409	Bothaville	0.425	0.456	0.032

Table A.7: Continued

Province	Code	Magisterial District (MD) name	1996	2001	Difference
FS	410	Bultfontein	0.497	0.512	0.015
FS	411	Heilbron	0.456	0.477	0.021
FS	412	Hennenman	0.425	0.418	-0.007
FS	413	Hoopstad	0.492	0.484	-0.009
FS	414	Koppies	0.459	0.385	-0.074
FS	415	Kroonstad	0.330	0.306	-0.025
FS	416	Parys	0.414	0.370	-0.044
FS	417	Theunissen	0.462	0.498	0.036
FS	418	Ventersburg	0.491	0.458	-0.032
FS	419	Vredefort	0.491	0.448	-0.042
FS	420	Viljoenskroon	0.472	0.417	-0.054
FS	421	Wesselsbron	0.497	0.502	0.005
FS	422	Bethlehem	0.359	0.410	0.051
FS	423	Ficksburg	0.468	0.498	0.030
FS	424	Fouriesburg	0.560	0.602	0.042
FS	425	Frankfort	0.450	0.407	-0.044
FS	426	Harrismith	0.468	0.457	-0.011
FS	427	Lindley	0.503	0.481	-0.022
FS	428	Reitz	0.531	0.511	-0.020
FS	429	Senekal	0.488	0.519	0.032
FS	430	Vrede	0.524	0.490	-0.034
FS	431	Brandfort	0.448	0.495	0.047
FS	432	Clocolan	0.491	0.585	0.094
FS	433	Dewetsdorp	0.425	0.434	0.010
FS	434	Edenburg	0.367	0.331	-0.037
FS	435	Excelsior	0.530	0.482	-0.049
FS	436	Jagersfontein	0.339	0.319	-0.020
FS	437	Ladybrand	0.410	0.419	0.009
FS	438	Marquard	0.547	0.534	-0.012
FS	439	Philippolis	0.337	0.358	0.021
FS	440	Reddersburg	0.368	0.388	0.020
FS	441	Trompsburg	0.382	0.388	0.006
FS	442	Wepener	0.487	0.448	-0.038
FS	443	Winburg	0.466	0.433	-0.033
FS	444	Botshabelo	0.471	0.506	0.035
FS	445	Bloemfontein	0.283	0.313	0.030
FS	446	Smithfield	0.463	0.426	-0.037
FS	447	Bethulie	0.380	0.321	-0.059
FS	448	Rouxville	0.448	0.417	-0.031
FS	449	Zastron	0.476	0.446	-0.030
FS	450	Sasolburg	0.322	0.335	0.013
FS	451	Thaba 'Nchu	0.486	0.444	-0.042
FS	452	Witsieshoek	0.566	0.526	-0.040
KZN	501	Durban	0.178	0.188	0.011
KZN	502	Inanda	0.321	0.302	-0.018
KZN	503	Pinetown	0.327	0.293	-0.034
KZN	504	Chatswoth	0.185	0.202	0.017
KZN	505	Camperdown	0.495	0.472	-0.023
KZN	506	Richmond	0.671	0.663	-0.008
KZN	507	Pietermaritzburg	0.408	0.390	-0.018
KZN	508	Umzinto	0.640	0.593	-0.047

Table A.7: Continued

Province	Code	Magisterial District (MD) name	1996	2001	Difference
KZN	509	Ixopo	0.742	0.707	-0.036
KZN	510	Alfred	0.744	0.681	-0.063
KZN	511	Port Shepstone	0.535	0.522	-0.014
KZN	512	Mount Currie	0.438	0.410	-0.027
KZN	513	Underberg	0.634	0.581	-0.053
KZN	514	Polela	0.759	0.715	-0.045
KZN	515	Impendle	0.693	0.666	-0.027
KZN	516	Kranskop	0.770	0.757	-0.013
KZN	517	Lions River	0.378	0.378	0.000
KZN	518	New Hanover	0.678	0.615	-0.063
KZN	519	Mooi river	0.478	0.467	-0.011
KZN	520	Umvoti	0.664	0.631	-0.034
KZN	521	Bergville	0.719	0.689	-0.029
KZN	522	Estcourt	0.627	0.600	-0.027
KZN	523	Kliprivier	0.506	0.500	-0.006
KZN	524	Weenen	0.776	0.768	-0.008
KZN	525	Dannhauser	0.624	0.592	-0.031
KZN	526	Dundee	0.540	0.528	-0.012
KZN	527	Glencoe	0.469	0.399	-0.070
KZN	528	Newcastle	0.366	0.372	0.006
KZN	529	Utrecht	0.695	0.646	-0.049
KZN	530	Babanango	0.769	0.720	-0.049
KZN	531	Ngotshe	0.749	0.748	0.000
KZN	532	Paulpietersburg	0.672	0.637	-0.035
KZN	533	Vryheid	0.530	0.549	0.019
KZN	534	Eshowe	0.657	0.614	-0.043
KZN	535	Hlabisa	0.727	0.643	-0.084
KZN	536	Lower Umfolozi	0.570	0.495	-0.075
KZN	537	Mthonjaneni	0.784	0.705	-0.079
KZN	538	Mtunzini	0.588	0.527	-0.061
KZN	539	Ubombo	0.792	0.733	-0.060
KZN	540	Lower Tugela	0.452	0.441	-0.010
KZN	541	Umbumbulu	0.554	0.523	-0.031
KZN	542	Umlazi	0.348	0.324	-0.024
KZN	543	Ndwedwe	0.724	0.651	-0.072
KZN	544	Mapumulo	0.775	0.724	-0.052
KZN	545	Nkandla	0.811	0.760	-0.051
KZN	546	Nqutu	0.680	0.640	-0.040
KZN	547	Msinga	0.824	0.790	-0.035
KZN	548	Mhlabathini	0.722	0.661	-0.061
KZN	549	Nongoma	0.782	0.721	-0.060
KZN	550	Ingwavuma	0.806	0.747	-0.059
KZN	551	Simdlangentsha	0.679	0.615	-0.064
NW	601	Huhudi	0.642	0.606	-0.036
NW	602	Kudumane	0.654	0.618	-0.036
NW	603	Vryburg	0.379	0.417	0.038
NW	604	Phokwani	0.608	0.562	-0.046
NW	605	Mmabatho	0.515	0.515	0.000
NW	606	Madikwe	0.590	0.563	-0.027
NW	607	Lichtenburg	0.462	0.452	-0.010
NW	608	Delareyville	0.595	0.529	-0.066

Table A.7: Continued

Province	Code	Magisterial District (MD) name	1996	2001	Difference
NW	609	Schweizer-Reneke	0.540	0.514	-0.027
NW	610	Wolmaransstad	0.499	0.475	-0.024
NW	611	Christiana	0.431	0.394	-0.037
NW	612	Klerksdorp	0.344	0.350	0.006
NW	613	Ventersdorp	0.527	0.508	-0.020
NW	614	Potchefstroom	0.339	0.329	-0.010
NW	615	Mankwe	0.582	0.541	-0.041
NW	616	Rustenburg	0.452	0.434	-0.018
NW	617	Brits	0.433	0.453	0.021
NW	618	Ga-Rankuwa	0.462	0.432	-0.029
NW	619	Temba	0.554	0.532	-0.022
GAU	701	Pretoria	0.139	0.190	0.051
GAU	702	Soshanguve	0.381	0.349	-0.032
GAU	703	Wonderboom	0.225	0.288	0.062
GAU	704	Johannesburg	0.168	0.176	0.009
GAU	705	Randburg	0.211	0.219	0.008
GAU	706	Alberton	0.260	0.297	0.037
GAU	707	Benoni	0.321	0.322	0.001
GAU	708	Boksburg	0.209	0.251	0.042
GAU	709	Germiston	0.165	0.216	0.051
GAU	710	Kempton Park	0.297	0.280	-0.017
GAU	711	Brakpan	0.303	0.299	-0.004
GAU	712	Heidelberg	0.404	0.349	-0.056
GAU	713	Nigel	0.335	0.351	0.016
GAU	714	Springs	0.211	0.243	0.032
GAU	715	Krugersdorp	0.241	0.296	0.056
GAU	716	Oberholzer	0.329	0.303	-0.026
GAU	717	Randfontein	0.288	0.276	-0.012
GAU	718	Roodepoort	0.197	0.222	0.025
GAU	719	Westonaria	0.329	0.383	0.054
GAU	720	Bronkhorstspruit	0.442	0.425	-0.017
GAU	721	Cullinan	0.496	0.316	-0.180
GAU	722	Vereeniging	0.336	0.342	0.006
GAU	723	Vanderbijlpark	0.337	0.276	-0.061
GAU	724	Soweto	0.234	0.258	0.024
MPU	801	Amersfoort	0.611	0.608	-0.003
MPU	802	Bethal	0.413	0.414	0.000
MPU	803	Carolina	0.527	0.550	0.023
MPU	804	Ermelo	0.423	0.444	0.021
MPU	805	Piet Retief	0.542	0.597	0.054
MPU	806	Standerton	0.416	0.441	0.025
MPU	807	Volksrust	0.393	0.404	0.011
MPU	808	Wakkerstroom	0.689	0.680	-0.009
MPU	809	Kriel	0.208	0.259	0.052
MPU	810	Balfour	0.472	0.440	-0.032
MPU	811	Ho‰veldrif	0.346	0.352	0.005
MPU	812	Delmas	0.374	0.446	0.072
MPU	813	Belfast	0.423	0.398	-0.025
MPU	814	Groblersdal	0.524	0.527	0.003
MPU	815	Middelburg	0.312	0.324	0.012
MPU	816	Waterval Boven	0.426	0.343	-0.083

Table A.7: Continued

Province	Code	Magisterial District (MD) name	1996	2001	Difference
MPU	817	Witbank	0.300	0.333	0.033
MPU	818	Moutse	0.608	0.592	-0.016
MPU	819	Barberton	0.419	0.432	0.013
MPU	820	Lydenburg	0.427	0.481	0.055
MPU	821	Nelspruit	0.265	0.270	0.005
MPU	822	Pelgrimsrust	0.453	0.460	0.006
MPU	823	Witrivier	0.302	0.476	0.174
MPU	824	Eerstehoek	0.648	0.603	-0.045
MPU	825	Nkomazi	0.621	0.606	-0.014
MPU	826	Nsikazi	0.503	0.475	-0.028
MPU	827	Mdutjana	0.482	0.474	-0.008
MPU	828	Mkobola	0.553	0.512	-0.041
MPU	829	Mbibana	0.541	0.549	0.008
MPU	830	Kwamhlanga	0.500	0.469	-0.031
MPU	831	Moretele	0.637	0.595	-0.042
LIM	901	Letaba	0.514	0.505	-0.009
LIM	902	Messina	0.343	0.360	0.017
LIM	903	Phalaborwa	0.235	0.335	0.100
LIM	904	Pietersburg	0.220	0.354	0.133
LIM	905	Soutpansberg	0.330	0.413	0.083
LIM	906	Potgietersrus	0.418	0.502	0.084
LIM	907	Waterberg	0.503	0.496	-0.007
LIM	908	Ellisras	0.329	0.343	0.014
LIM	909	Thabazimbi	0.394	0.427	0.033
LIM	910	Warmbad	0.385	0.376	-0.009
LIM	911	Malamulela	0.700	0.694	-0.006
LIM	912	Hlanganani	0.650	0.622	-0.028
LIM	913	Namakgale	0.423	0.431	0.008
LIM	914	Mhala	0.627	0.607	-0.020
LIM	915	Ritavi	0.610	0.565	-0.045
LIM	916	Giyani	0.664	0.669	0.005
LIM	917	Lulekani	0.590	0.565	-0.025
LIM	918	Bolobedu	0.678	0.670	-0.008
LIM	919	Sekgosese	0.643	0.619	-0.024
LIM	920	Bochum	0.693	0.660	-0.032
LIM	921	Mokerong	0.630	0.578	-0.052
LIM	922	Seshego	0.575	0.550	-0.025
LIM	923	Thabamoopo	0.581	0.558	-0.023
LIM	924	Nebo	0.668	0.622	-0.046
LIM	925	Sekhukhuneland	0.703	0.653	-0.049
LIM	926	Naphuno	0.666	0.634	-0.032
LIM	927	Mapulaneng	0.626	0.600	-0.026
LIM	928	Dzanani	0.617	0.583	-0.034
LIM	929	Mutali	0.710	0.676	-0.035
LIM	930	Thohoyandou	0.611	0.590	-0.022
LIM	931	Vuwani	0.653	0.638	-0.016
RSA	999	South Africa	0.456	0.435	-0.021

Source: Researcher's own calculations based on Census 1996 and Census 2001 data.

Table A.8: Mean deprivation by municipality, Census 2001 and CS 2007

Code	Municipality Name	2001	2007	Difference
81	CBLC1: Ga-Segonyana	0.507	0.389	-0.118
82	CBLC2: Kungwini	0.359	0.304	-0.055
83	CBLC3: Greater Marble Hall	0.597	0.529	-0.068
84	CBLC4: Greater Groblersdal	0.580	0.514	-0.067
85	CBLC5: Greater Tubatse	0.646	0.551	-0.095
86	CBLC6: Bushbuckridge	0.604	0.530	-0.074
87	CBLC7: Phokwane	0.375	0.322	-0.053
88	CBLC8: Merafong City	0.316	0.294	-0.022
101	WC011: Matzikama	0.267	0.192	-0.075
102	WC012: Cederberg	0.279	0.211	-0.068
103	WC013: Bergrivier	0.245	0.173	-0.072
104	WC014: Saldanha Bay	0.191	0.120	-0.071
105	WC015: Swartland	0.233	0.161	-0.072
106	WC022: Witzenberg	0.259	0.230	-0.028
107	WC023: Drakenstein	0.240	0.206	-0.034
108	WC024: Stellenbosch	0.229	0.160	-0.069
109	WC025: Breede Valley	0.240	0.192	-0.048
110	WC026: Breede River/Winelands	0.270	0.186	-0.084
111	WC031: Theewaterskloof	0.269	0.196	-0.073
112	WC032: Overstrand	0.216	0.158	-0.058
113	WC033: Cape Agulhas	0.206	0.162	-0.044
114	WC034: Swellendam	0.256	0.169	-0.087
115	WC041: Kannaland	0.320	0.272	-0.047
116	WC042: Langeberg	0.256	0.187	-0.068
117	WC043: Mossel Bay	0.225	0.176	-0.049
118	WC044: George	0.254	0.208	-0.046
119	WC045: Oudtshoorn	0.293	0.231	-0.062
120	WC047: Plettenberg Bay	0.271	0.223	-0.048
121	WC048: Knysna	0.303	0.250	-0.054
122	WC051: Laingsburg	0.325	0.247	-0.079
123	WC052: Prince Albert	0.312	0.241	-0.071
124	WC053: Beaufort West	0.249	0.190	-0.058
171	Cape Town: City of Cape Town	0.216	0.166	-0.049
191	WCDMA01: West Coast	0.359	0.262	-0.097
192	WCDMA02: Breede River	0.350	0.288	-0.062
193	WCDMA03: Overberg	N/A	0.056	N/A
194	WCDMA04: South Cape	0.397	0.278	-0.119
195	WCDMA05: Central Karoo	0.365	0.270	-0.095
201	EC101: Camdeboo	0.304	0.202	-0.102
202	EC102: Blue Crane Route	0.397	0.295	-0.102
203	EC103: Ikwezi	0.398	0.307	-0.092
204	EC104: Makana	0.396	0.273	-0.122
205	EC105: Ndlambe	0.424	0.295	-0.129
206	EC106: Sunday's River Valley	0.481	0.311	-0.171
207	EC107: Baviaans	0.395	0.278	-0.116
208	EC108: Kouga	0.336	0.204	-0.132
209	EC109: Kou-Kamma	0.329	0.295	-0.034
210	EC121: Mbhashe	0.780	0.713	-0.067
211	EC122: Mnquma	0.690	0.567	-0.122
212	EC123: Great Kei	0.654	0.511	-0.143
213	EC124: Amahlathi	0.611	0.512	-0.099
214	EC125: Buffalo City	0.386	0.315	-0.072

Table A.8: Continued

Code	Municipality Name	2001	2007	Difference
215	EC126: Ngqushwa	0.645	0.551	-0.094
216	EC127: Nkonkobe	0.571	0.503	-0.069
217	EC128: Nxuba	0.443	0.334	-0.109
218	EC131: Inxuba Yethemba	0.299	0.233	-0.066
219	EC132: Tsolwana	0.575	0.489	-0.087
220	EC133: Inkwanca	0.414	0.294	-0.120
221	EC134: Lukanji	0.436	0.320	-0.116
222	EC135: Intsika Yethu	0.746	0.650	-0.096
223	EC136: Emalahleni	0.685	0.599	-0.086
224	EC137: Engcobo	0.769	0.678	-0.091
225	EC138: Sakhisizwe	0.579	0.518	-0.061
226	EC141: Elundini	0.710	0.635	-0.075
227	EC142: Senqu	0.624	0.550	-0.074
228	EC143: Maletswai	0.442	0.312	-0.130
229	EC144: Gariep	0.414	0.303	-0.111
230	EC151: Mbizana	0.741	0.669	-0.071
231	EC152: Ntabankulu	0.782	0.698	-0.084
232	EC153: Qaukeni	0.746	0.670	-0.076
233	EC154: Port St Johns	0.791	0.681	-0.110
234	EC155: Nyandeni	0.759	0.658	-0.101
235	EC156: Mhlontlo	0.740	0.650	-0.091
236	EC157: King Sabata Dalindyebo	0.652	0.538	-0.114
237	EC05b1: Umzimkhulu	0.707	0.634	-0.073
238	EC05b2: Umzimvubu	0.712	0.612	-0.099
275	Port Elizabeth: Nelson Mandela	0.280	0.211	-0.070
291	ECDMA10: Aberdeen Plain	0.460	0.336	-0.124
301	NC061: Richtersveld	0.229	0.208	-0.021
302	NC062: Nama Khoi	0.258	0.202	-0.055
303	NC064: Kamiesberg	0.371	0.299	-0.072
304	NC065: Hantam	0.313	0.238	-0.075
305	NC066: Karoo Hoogland	0.352	0.328	-0.024
306	NC067: Kh?i-Ma	0.326	0.220	-0.106
307	NC071: Ubuntu	0.363	0.274	-0.089
308	NC072: Umsombomvu	0.386	0.309	-0.077
309	NC073: Emthanjeni	0.292	0.219	-0.073
310	NC074: Kareeberg	0.393	0.325	-0.068
311	NC075: Renosterberg	0.342	0.322	-0.020
312	NC076: Thembelihle	0.404	0.287	-0.117
313	NC077: Siyathemba	0.309	0.284	-0.025
314	NC078: Siyancuma	0.415	0.307	-0.108
315	NC081: Mier	0.476	0.348	-0.127
316	NC082: Kai !Garib	0.366	0.344	-0.022
317	NC083: ǁKhara Hais	0.299	0.237	-0.062
318	NC084: !Kheis	0.444	0.365	-0.079
319	NC085: Tsantsabane	0.311	0.271	-0.040
320	NC086: Kgatelopele	0.273	0.210	-0.063
321	NC091: Sol Plaatje	0.268	0.215	-0.054
322	NC092: Dikgatlong	0.426	0.319	-0.107
323	NC093: Magareng	0.385	0.294	-0.092
324	NC01B1: Gamagara	0.231	0.193	-0.038
391	NCDMA06: Namaqualand	0.491	0.365	-0.126

Table A.8: Continued

Code	Municipality Name	2001	2007	Difference
392	NCDMA07: Bo Karoo	0.511	0.410	-0.101
393	NCDMA08: Benede Oranje	0.412	0.438	0.026
394	NCDMA09: Diamondfields	0.499	0.470	-0.029
395	NCDMACB1: Kalahari	0.390	0.241	-0.149
401	FS161: Letsemeng	0.381	0.312	-0.069
402	FS162: Kopanong	0.349	0.275	-0.074
403	FS163: Mohokare	0.434	0.374	-0.061
404	FS171: Naledi	0.444	0.300	-0.144
405	FS172: Mangaung	0.382	0.266	-0.116
406	FS173: Mantsopa	0.444	0.301	-0.143
407	FS181: Masilonyana	0.480	0.327	-0.153
408	FS182: Tokologo	0.459	0.405	-0.054
409	FS183: Tswelopele	0.500	0.340	-0.161
410	FS184: Matjhabeng	0.386	0.250	-0.137
411	FS185: Nala	0.472	0.378	-0.095
412	FS191: Setsoto	0.523	0.393	-0.129
413	FS192: Dihlabeng	0.448	0.286	-0.163
414	FS193: Nketoana	0.501	0.437	-0.063
415	FS194: Maluti a Phofung	0.510	0.394	-0.116
416	FS195: Phumelela	0.505	0.355	-0.150
417	FS201: Moqhaka	0.340	0.260	-0.079
418	FS203: Ngwathe	0.422	0.251	-0.171
419	FS204: Metsimaholo	0.339	0.197	-0.142
420	FS205: Mafube	0.420	0.281	-0.139
501	KZ211: Vulamehlo	0.700	0.659	-0.041
502	KZ212: Umdoni	0.431	0.404	-0.027
503	KZ213: Umzumbe	0.691	0.627	-0.064
504	KZ214: uMuziwabantu	0.676	0.615	-0.060
505	KZ215: Ezingoleni	0.688	0.613	-0.076
506	KZ216: Hibiscus Coast	0.484	0.406	-0.078
507	KZ221: uMshwathi	0.613	0.515	-0.098
508	KZ222: uMngeni	0.366	0.300	-0.066
509	KZ223: Mooi Mpofana	0.524	0.393	-0.131
510	KZ224: Impendle	0.658	0.579	-0.078
511	KZ225: Msunduzi	0.377	0.276	-0.101
512	KZ226: Mkhambathini	0.637	0.586	-0.051
513	KZ227: Richmond	0.624	0.498	-0.126
514	KZ232: Emnambithi/Ladysmith	0.464	0.388	-0.076
515	KZ233: Indaka	0.667	0.552	-0.115
516	KZ234: Umtshezi	0.489	0.422	-0.067
517	KZ235: Okhahlamba	0.682	0.565	-0.117
518	KZ236: Imbabazane	0.676	0.625	-0.050
519	KZ241: Endumeni	0.355	0.297	-0.058
520	KZ242: Nqutu	0.695	0.604	-0.090
522	KZ244: Msinga	0.787	0.701	-0.087
523	KZ245: Umvoti	0.637	0.540	-0.097
524	KZ252: Newcastle	0.362	0.283	-0.078
525	KZ253: Utrecht	0.645	0.538	-0.108
526	KZ254: Dannhauser	0.593	0.501	-0.092
527	KZ261: eDumbe	0.649	0.589	-0.060
528	KZ262: uPhongolo	0.627	0.497	-0.130

Table A.8: Continued.

Code	Municipality Name	2001	2007	Difference
529	KZ263: Abaqulusi	0.564	0.477	-0.087
530	KZ265: Nongoma	0.721	0.646	-0.076
531	KZ266: Ulundi	0.679	0.564	-0.115
532	KZ271: Umhlabuyalingana	0.746	0.613	-0.133
533	KZ272: Jozini	0.733	0.584	-0.149
534	KZ273: The Big 5 False Bay	0.720	0.611	-0.109
535	KZ274: Hlabisa	0.689	0.599	-0.091
536	KZ275: Mtubatuba	0.437	0.399	-0.038
537	KZ281: Mbonambi	0.648	0.519	-0.129
538	KZ282: uMhlathuze	0.390	0.327	-0.063
539	KZ283: Ntambanana	0.704	0.609	-0.095
540	KZ284: uMlalazi	0.678	0.605	-0.073
541	KZ285: Mthonjaneni	0.654	0.626	-0.028
542	KZ286: Nkandla	0.757	0.653	-0.103
543	KZ291: eNdondakusuka	0.526	0.461	-0.065
544	KZ292: KwaDukuza	0.416	0.346	-0.070
545	KZ293: Ndwedwe	0.695	0.655	-0.040
546	KZ294: Maphumulo	0.742	0.646	-0.096
547	KZ5a1: Ingwe	0.716	0.658	-0.058
548	KZ5a2: Kwa Sani	0.595	0.498	-0.097
549	KZ5a3: Matatiele	0.358	0.229	-0.128
550	KZ5a4: Greater Kokstad	0.424	0.321	-0.103
551	KZ5a5: Ubuhlebezwe	0.697	0.633	-0.064
572	Durban: Ethekwini	0.306	0.244	-0.062
592	KZDMA23: Gaints Castle Game Reserve	0.379	N/A	N/A
593	KZDMA27: St Lucia Park	0.625	0.566	-0.059
594	KZDMA43: Mkhomazi Wilderness Area	0.498	N/A	N/A
601	NW371: Moretele	0.573	0.390	-0.183
602	NW372: Madibeng	0.483	0.399	-0.084
603	NW373: Rustenburg	0.428	0.340	-0.088
604	NW374: Kgetlengrivier	0.453	0.365	-0.089
605	NW375: Moses Kotane	0.536	0.390	-0.145
606	NW381: Setla-Kgobi	0.621	0.575	-0.046
607	NW382: Tswaing	0.535	0.431	-0.104
608	NW383: Mafikeng	0.468	0.438	-0.029
609	NW384: Ditsobotla	0.463	0.389	-0.074
610	NW385: Zeerust	0.559	0.499	-0.060
611	NW391: Kagisano	0.622	0.572	-0.050
612	NW392: Naledi	0.395	0.307	-0.087
613	NW393: Mamusa	0.508	0.359	-0.148
614	NW394: Greater Taung	0.591	0.513	-0.078
615	NW395: Molopo	0.522	0.467	-0.055
616	NW396: Lekwa-Teemane	0.399	0.300	-0.099
617	NW401: Ventersdorp	0.504	0.415	-0.089
618	NW402: Potchefstroom	0.324	0.233	-0.092
619	NW403: City Council of Klerksdorp	0.353	0.262	-0.091
620	NW404: Maquassi Hills	0.465	0.391	-0.074
621	NW1a1: Moshaweng	0.665	0.602	-0.063
701	GT411: Mogale City	0.291	0.226	-0.065
702	GT412: Randfontein	0.270	0.211	-0.058
703	GT414: Westonaria	0.416	0.353	-0.063

Table A.8: Continued

Code	Municipality Name	2001	2007	Difference
704	GT421: Emfuleni	0.293	0.218	-0.075
705	GT422: Midvaal	0.321	0.203	-0.117
706	GT423: Lesedi	0.338	0.221	-0.117
707	GT02b1: Nokeng tsa Taemane	0.339	0.289	-0.050
773	East Rand: Ekurhuleni Metro	0.281	0.211	-0.069
774	Johannesburg: City of Johannesburg Metro	0.244	0.188	-0.056
776	Pretoria: City of Tshwane Metro	0.282	0.237	-0.045
791	GTDMA41: West Rand	0.390	0.394	0.005
801	MP301: Albert Luthuli	0.595	0.515	-0.081
802	MP302: Msukaligwa	0.427	0.305	-0.122
803	MP303: Mkhondo	0.615	0.451	-0.163
804	MP304: Seme	0.520	0.411	-0.109
805	MP305: Lekwa	0.439	0.291	-0.148
806	MP306: Dipaleseng	0.447	0.343	-0.104
807	MP307: Highveld East	0.365	0.228	-0.137
808	MP311: Delmas	0.432	0.286	-0.146
809	MP312: Emalahleni	0.319	0.292	-0.027
810	MP313: Middelburg	0.305	0.220	-0.085
811	MP314: Highlands	0.400	0.262	-0.138
812	MP315: Thembisile	0.516	0.424	-0.092
813	MP316: Dr JS Moroka	0.526	0.456	-0.070
814	MP321: Thaba Chweu	0.409	0.349	-0.060
815	MP322: Mbombela	0.454	0.342	-0.112
816	MP323: Umjindi	0.384	0.281	-0.104
817	MP324: Nkomazi	0.589	0.456	-0.132
891	CBDMA3: Schuinsdraai Nature Reserve	N/A	0.354	N/A
892	MPDMA31: Mdala Nature Reserve	N/A	0.436	N/A
893	MPDMA32: Lowveld	0.629	0.327	-0.301
901	NP331: Greater Giyani	0.666	0.556	-0.110
902	NP332: Greater Letaba	0.638	0.554	-0.084
903	NP333: Greater Tzaneen	0.602	0.520	-0.082
904	NP334: Ba-Phalaborwa	0.457	0.361	-0.096
905	NP341: Musina	0.417	0.319	-0.098
906	NP342: Mutale	0.672	0.586	-0.087
907	NP343: Thulamela	0.623	0.513	-0.110
908	NP344: Makhado	0.591	0.516	-0.075
909	NP351: Blouberg	0.674	0.596	-0.078
910	NP352: Aganang	0.614	0.509	-0.105
911	NP353: Molemole	0.560	0.487	-0.073
912	NP354: Polokwane	0.484	0.394	-0.090
913	NP355: Lepele-Nkumpi	0.572	0.485	-0.087
914	NP361: Thabazimbi	0.427	0.286	-0.140
915	NP362: Lephalale	0.534	0.498	-0.036
916	NP364: Mookgopong	0.411	0.259	-0.152
917	NP365: Modimolle	0.497	0.325	-0.172
918	NP366: Bela-Bela	0.373	0.306	-0.067
919	NP367: Mogalakwena	0.560	0.458	-0.102
920	NP03A2: Makhuduthamaga	0.650	0.580	-0.070
921	NP03A3: Fetakgomo	0.653	0.586	-0.067
922	NP04A1: Maruleng	0.639	0.564	-0.075
996	CBDMA4: Kruger Park	0.275	0.066	-0.208
999	South Africa	0.435	0.349	-0.086

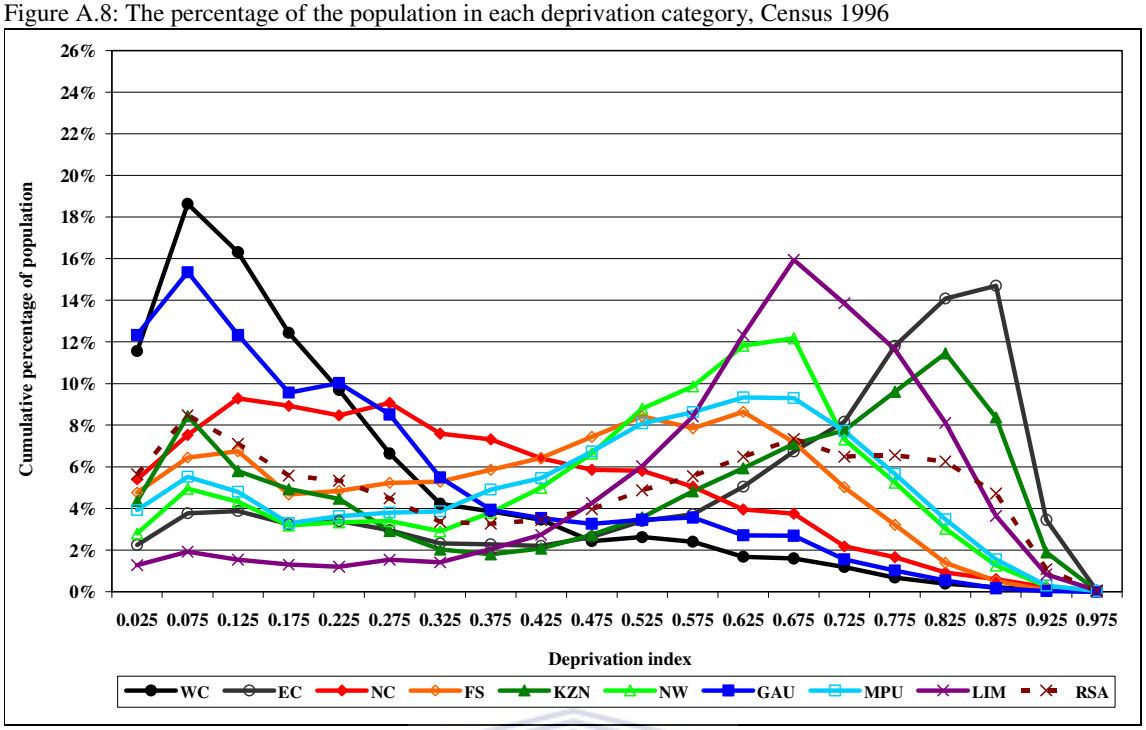
Source: Researcher's own calculations based on Census 2001 and CS 2007 data.

Table A.9: Mean deprivation by district council, Census 2001 and CS 2007

Code	District Council Name	2001	2007	Difference
1	DC1: West Coast District Municipality	0.239	0.166	-0.073
2	DC2: Boland District Municipality	0.246	0.194	-0.051
3	DC3: Overberg District Municipality	0.244	0.175	-0.069
4	DC4: Eden District Municipality	0.272	0.215	-0.057
5	DC5: Central Karoo District Municipality	0.281	0.213	-0.068
6	DC6: NAMAKWA District Municipality	0.294	0.232	-0.062
7	DC7: KAROO District Municipality	0.364	0.283	-0.080
8	DC8: SIYANDA District Municipality	0.339	0.288	-0.051
9	DC9: FRANCES BAARD District Municipality	0.318	0.252	-0.066
10	DC10: Cacadu District Municipality	0.383	0.265	-0.118
12	DC12: Amatole	0.553	0.469	-0.085
13	DC13: Chris Hani District Municipality	0.611	0.519	-0.092
14	DC14: Ukhahlamba District Municipality	0.619	0.535	-0.085
15	DC15: O.R.Tambo	0.731	0.637	-0.093
16	DC16: Xhariep District Municipality	0.379	0.315	-0.065
17	DC17: Motheo District Municipality	0.389	0.270	-0.119
18	DC18: Lejweleputswa District Municipality	0.422	0.288	-0.133
19	DC19: Thabo Mofutsanyane District Municipality	0.500	0.378	-0.122
20	DC20: Northern Free State District Municipality	0.373	0.242	-0.130
21	DC21: Ugu District Municipality	0.604	0.537	-0.066
22	DC22: UMgungundlovu District Municipality	0.453	0.354	-0.099
23	DC23: Uthukela District Municipality	0.585	0.502	-0.083
24	DC24: Umzinyathi District Municipality	0.679	0.589	-0.090
25	DC25: Amajuba District Municipality	0.434	0.341	-0.093
26	DC26: Zululand District Municipality	0.651	0.557	-0.094
27	DC27: Umkhanyakude District Municipality	0.703	0.580	-0.123
28	DC28: Uthungulu District Municipality	0.595	0.492	-0.103
29	DC29: iLembe District Municipality	0.588	0.515	-0.073
30	DC30: Govan Mbeki Municipality	0.486	0.359	-0.127
31	DC31: Nkangala	0.427	0.347	-0.080
32	DC32: Ehlanzeni	0.495	0.378	-0.117
33	DC33: Mopani District Municipality	0.607	0.517	-0.091
34	DC34: Vhembe District Municipality	0.608	0.512	-0.095
35	DC35: Capricorn District Municipality	0.553	0.464	-0.089
36	DC36: Waterberg District Municipality	0.516	0.415	-0.101
37	DC37: Bojanala District Municipality	0.489	0.374	-0.115
38	DC38: Central District Municipality	0.514	0.457	-0.058
39	DC39: Bophirima District Municipality	0.542	0.461	-0.081
40	DC40: Southern District Municipality	0.373	0.282	-0.091
42	DC42: Sedibeng District Municipality	0.299	0.217	-0.082
43	DC43: Sisonke District Municipality	0.627	0.564	-0.063
44	DC44: Alfred Nzo District Municipality	0.710	0.620	-0.090
81	CBDC1: KGALAGADI District Municipality	0.556	0.452	-0.104
82	CBDC2: Metsweding District Municipality	0.353	0.300	-0.053
83	CBDC3: Sekhukhune Cross Boundary District Municipality	0.627	0.551	-0.077
84	CBDC4: Bohlabela District Municipality	0.608	0.535	-0.073
88	CBDC8: West Rand District Municipality	0.311	0.262	-0.049
171	Cape Town: City of Cape Town	0.216	0.166	-0.049
275	Port Elizabeth: Nelson Mandela	0.280	0.211	-0.070
572	Durban: Ethekwini Municipality	0.306	0.244	-0.062
773	East Rand: Ekurhuleni Metropolitan Municipality	0.281	0.211	-0.069
774	Johannesburg: City of Johannesburg Metropolitan Municipality	0.244	0.188	-0.056
776	Pretoria: City of Tshwane Metropolitan Municipality	0.282	0.237	-0.045
999	South Africa	0.435	0.349	-0.086

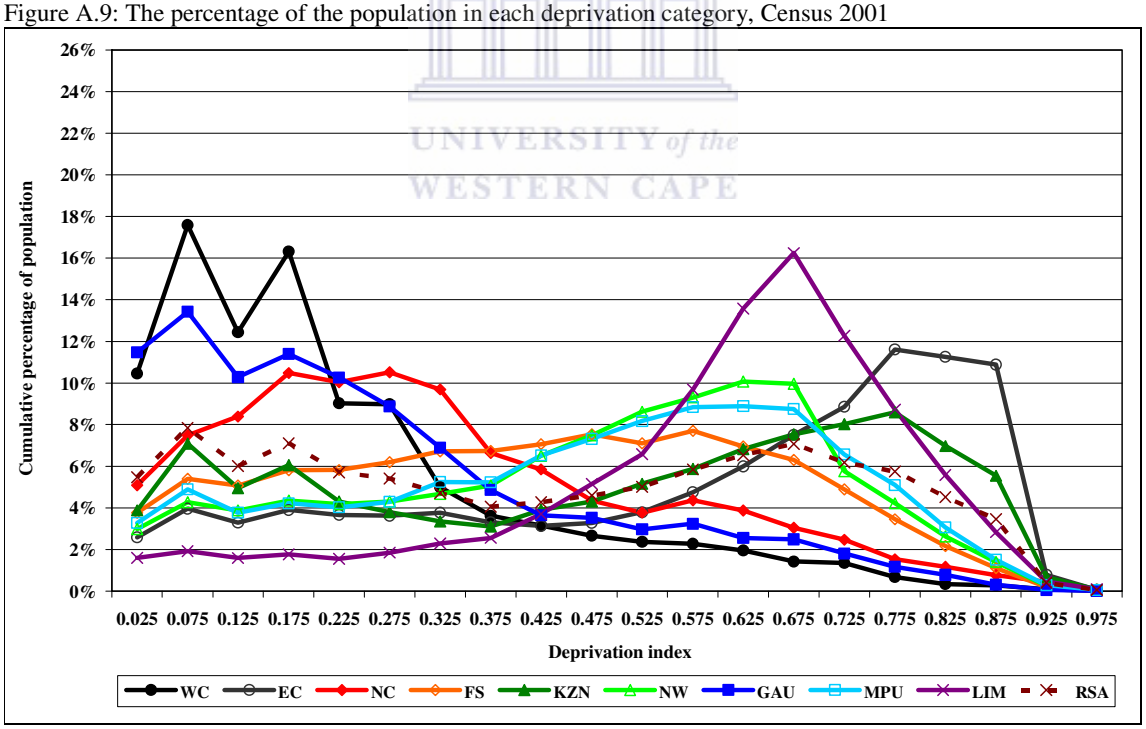
Source: Researcher's own calculations based on Census 2001 and CS 2007 data.

Figure A.8: The percentage of the population in each deprivation category, Census 1996



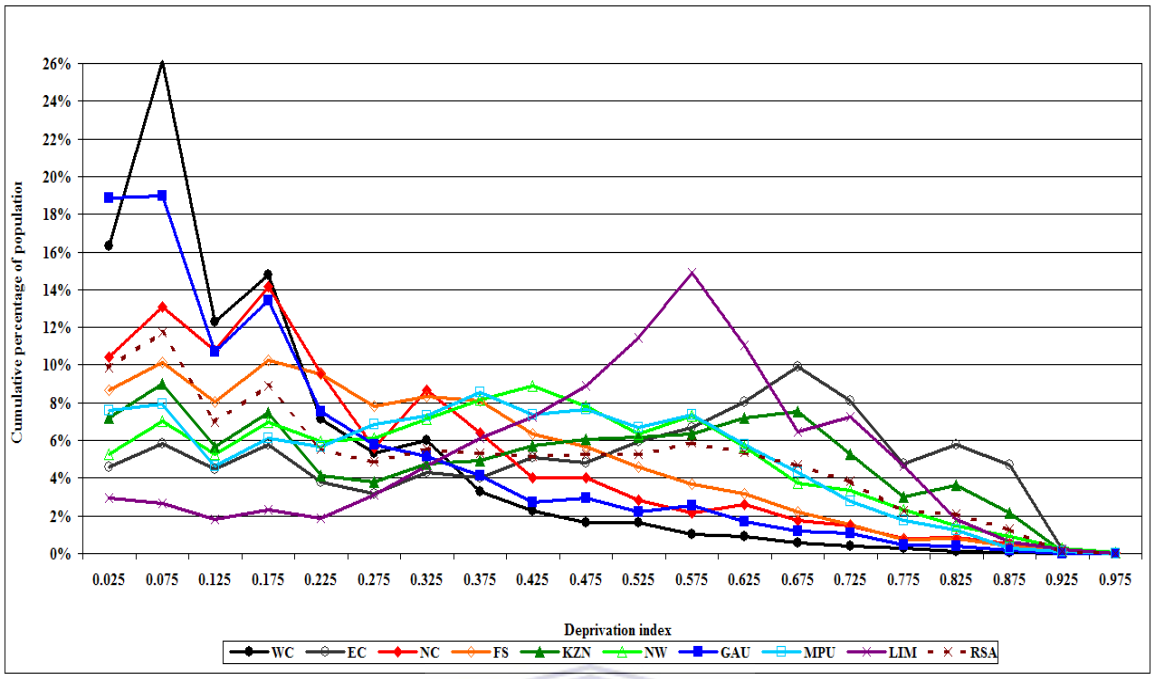
Source: Researcher's own calculations based on Census 1996 data.

Figure A.9: The percentage of the population in each deprivation category, Census 2001



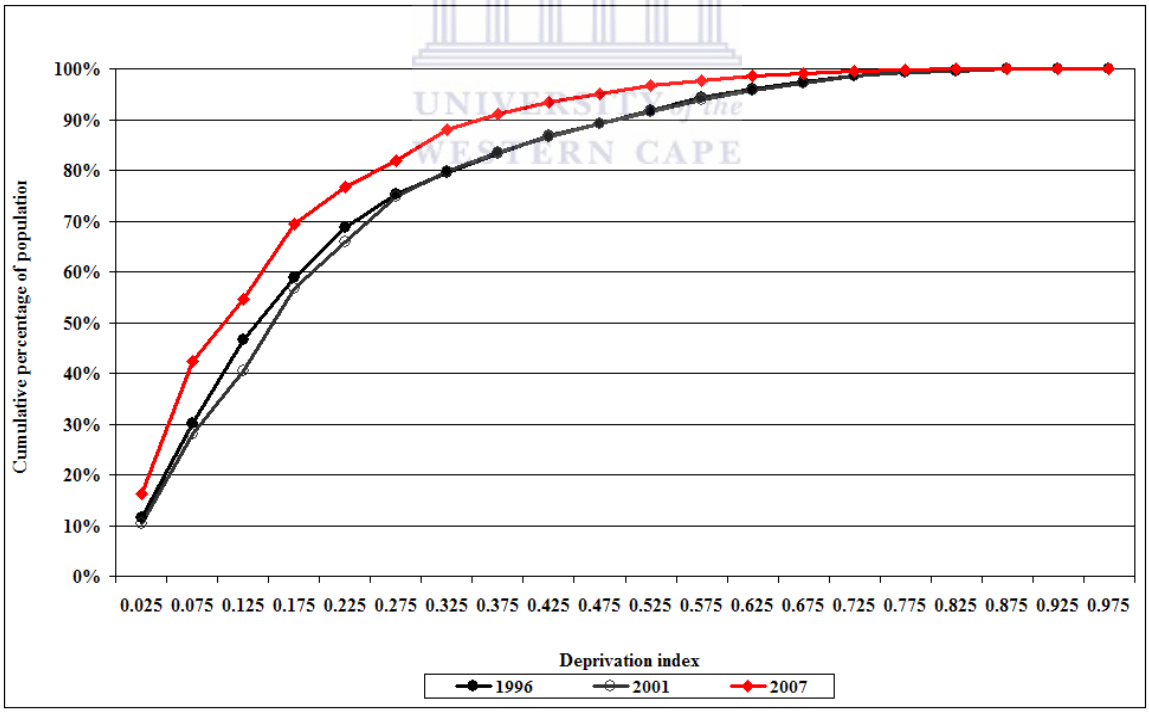
Source: Researcher's own calculations based on Census 2001 data.

Figure A.10: The percentage of the population in each deprivation category, CS 2007



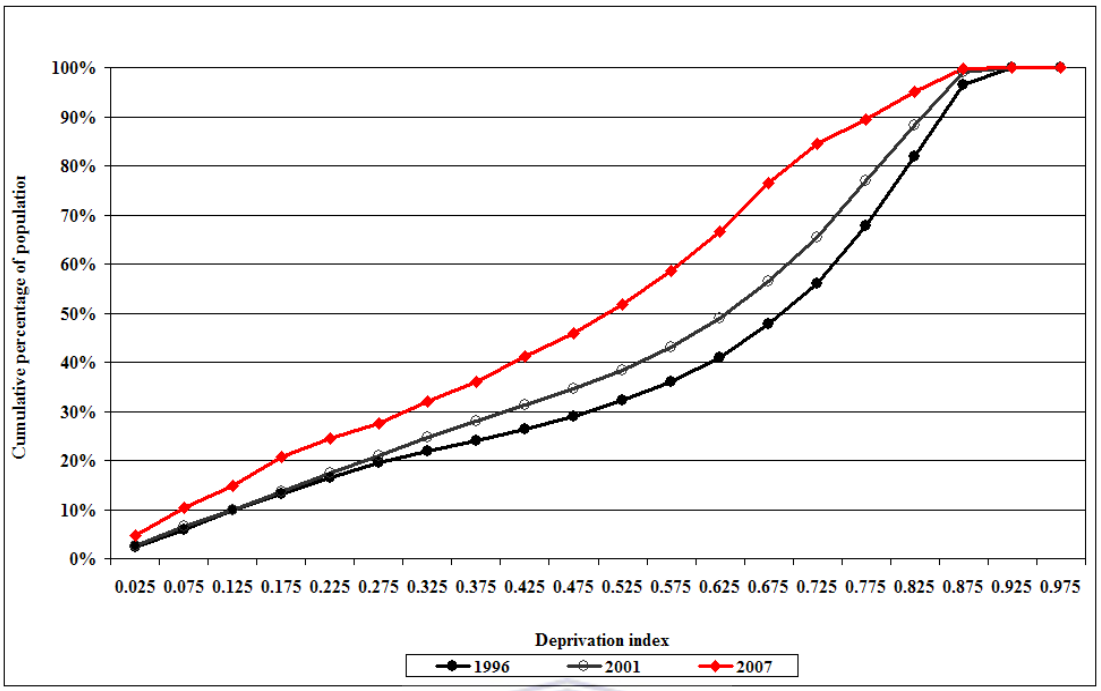
Source: Researcher's own calculations based on CS 2007 data.

Figure A.11: Cumulative distributive functions in Western Cape, 1996-2007



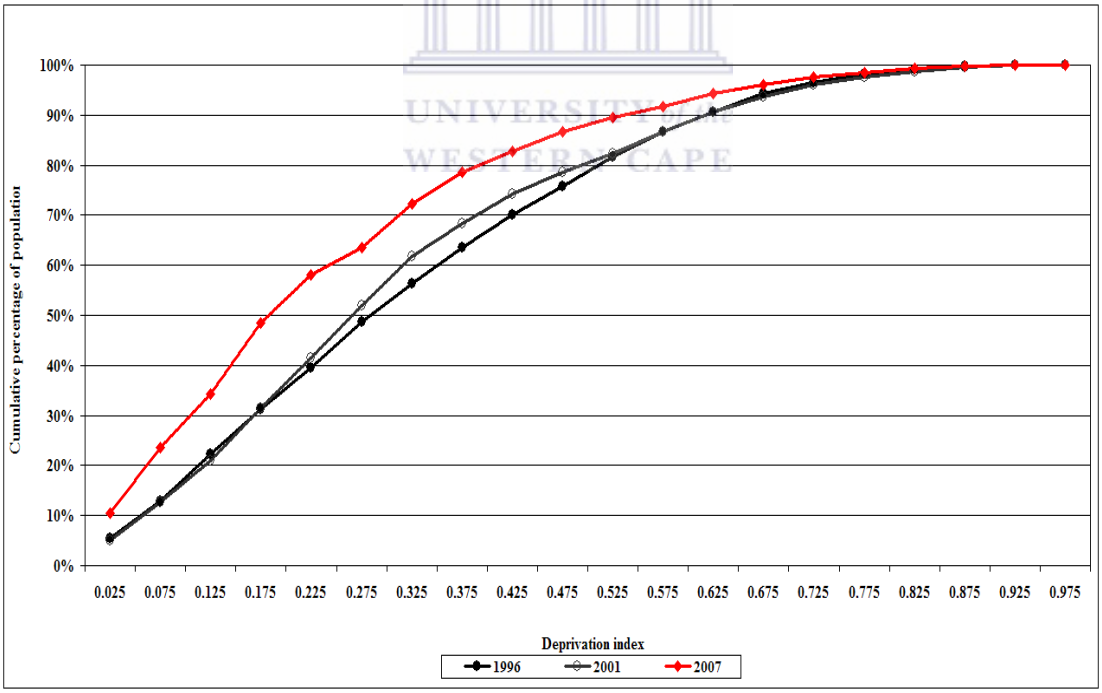
Source: Researcher's own calculations based on Census 1996, Census 2001 and CS 2007 data.

Figure A.12: Cumulative distributive functions in Eastern Cape, 1996 - 2007



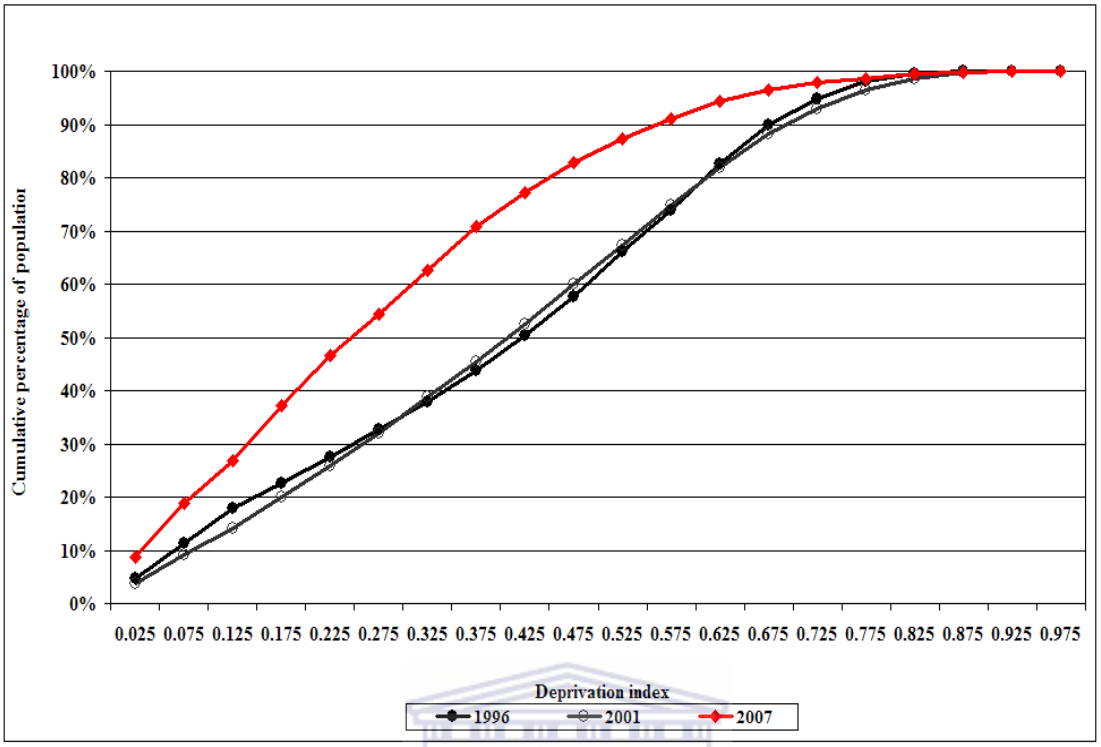
Source: Researcher's own calculations based on Census 1996, Census 2001 and CS 2007 data.

Figure A.13: Cumulative distributive functions in Northern Cape, 1996 - 2007



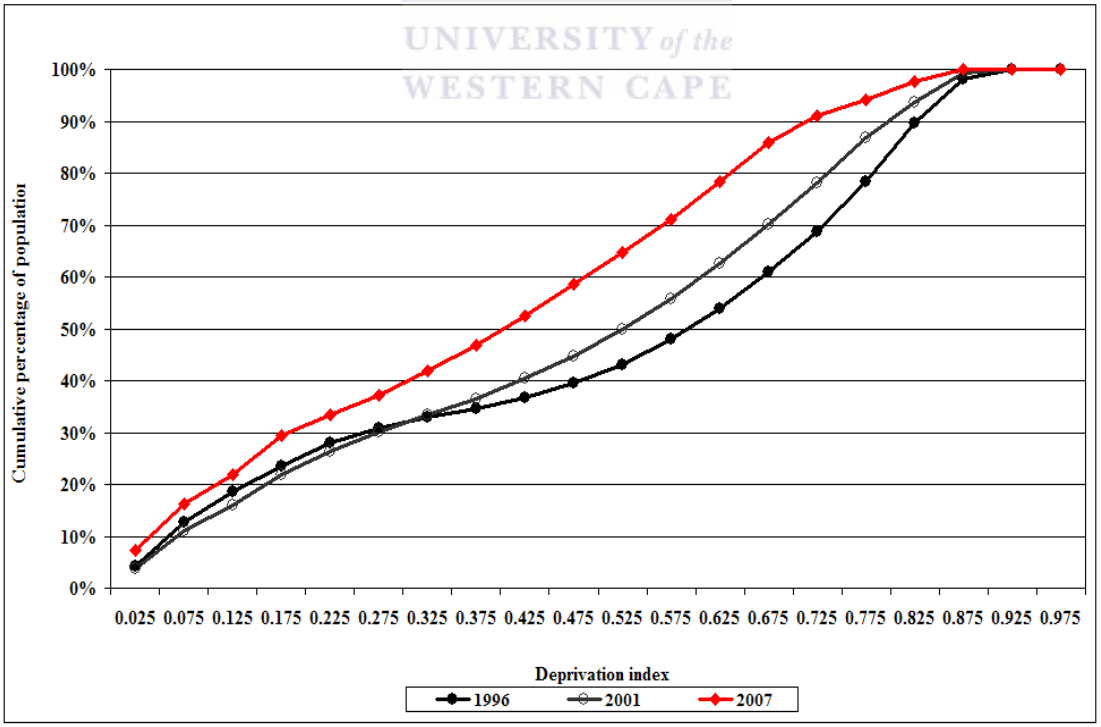
Source: Researcher's own calculations based on Census 1996, Census 2001 and CS 2007 data.

Figure A.14: Cumulative distributive functions in Free State, 1996 - 2007



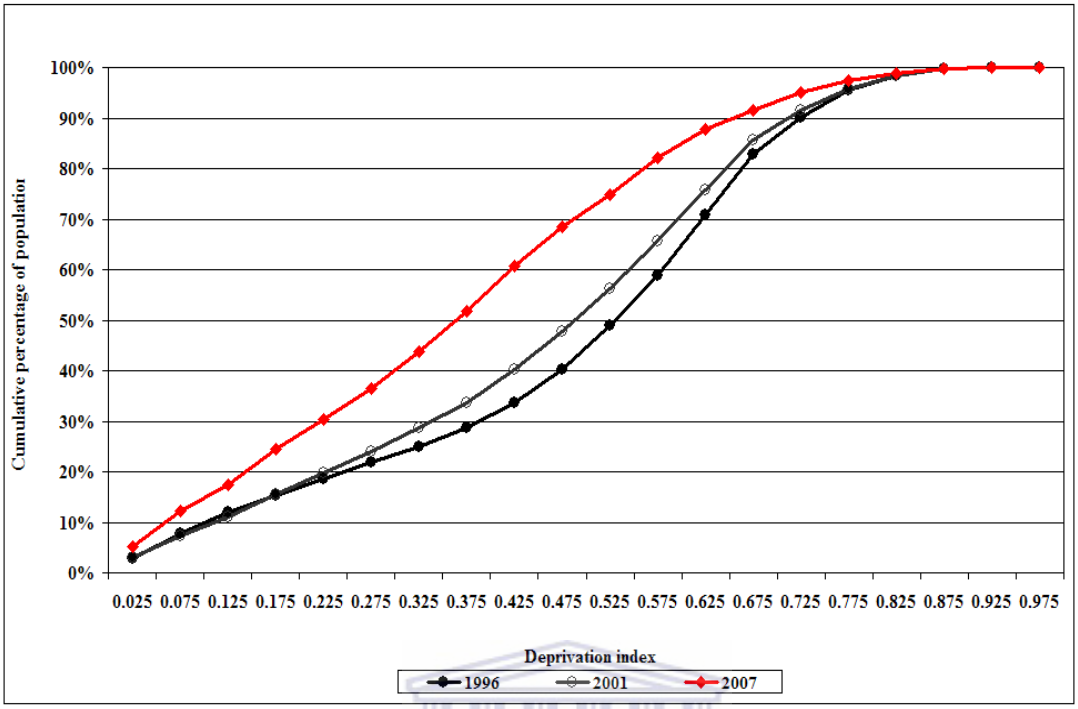
Source: Researcher's own calculations based on Census 1996, Census 2001 and CS 2007 data.

Figure A.15: Cumulative distributive functions in KwaZulu-Natal, 1996 – 2007



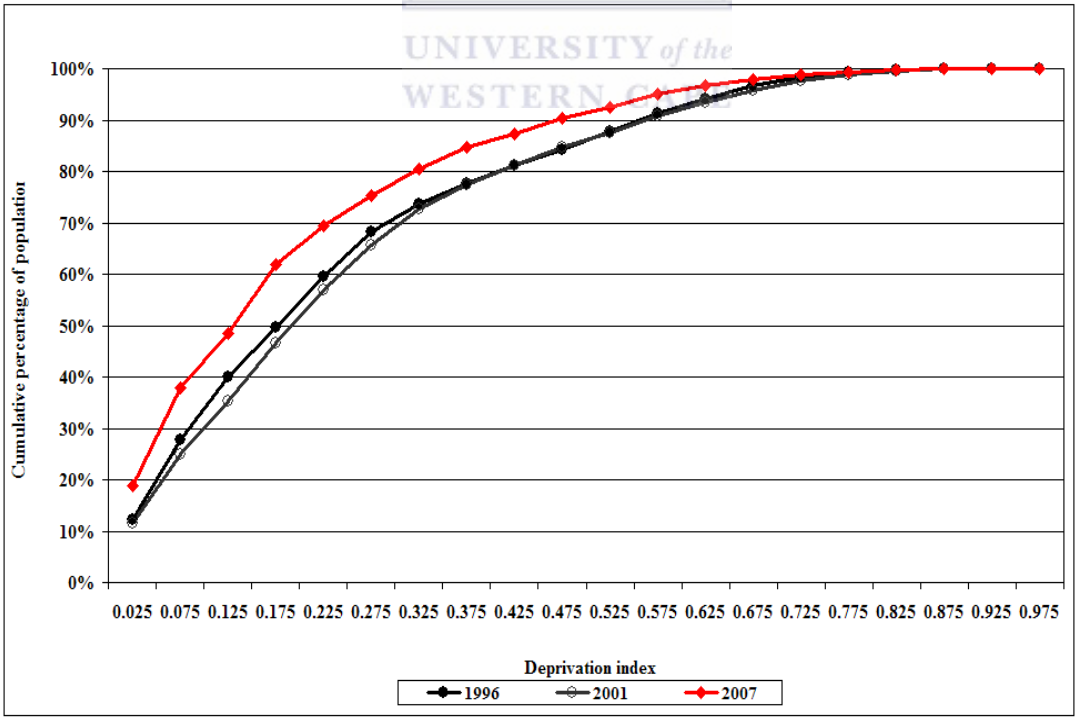
Source: Researcher's own calculations based on Census 1996, Census 2001 and CS 2007 data.

Figure A.16: Cumulative distributive functions in North West, 1996 – 2007



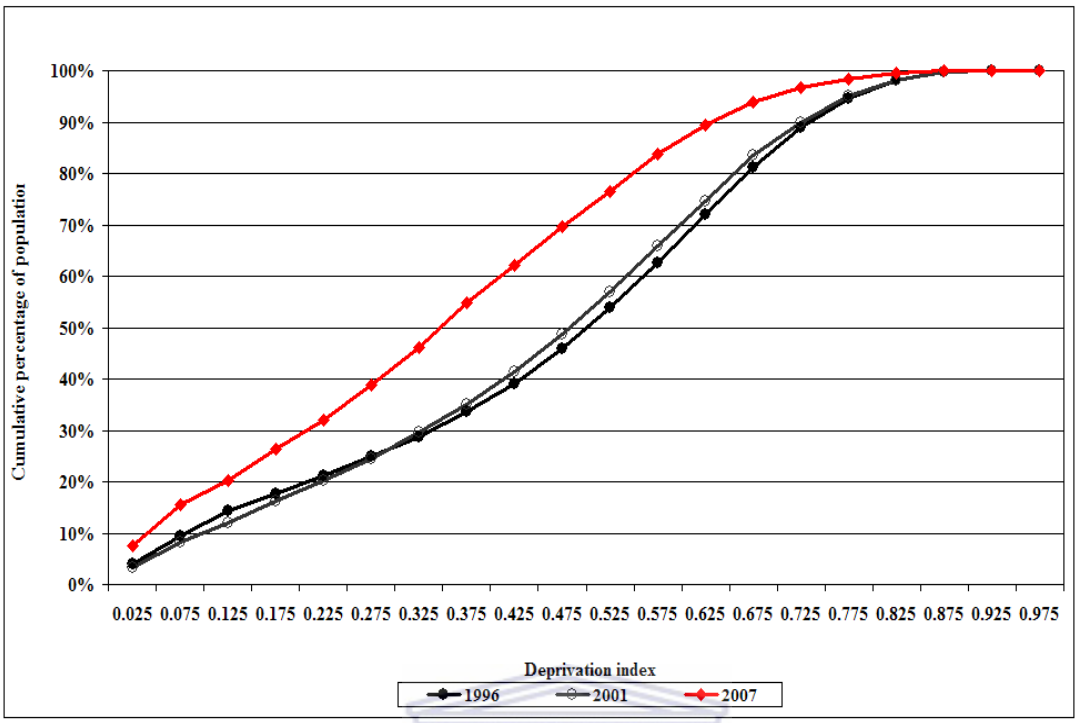
Source: Researcher's own calculations based on Census 1996, Census 2001 and CS 2007 data.

Figure A.17: Cumulative distributive functions in Gauteng, 1996 – 2007



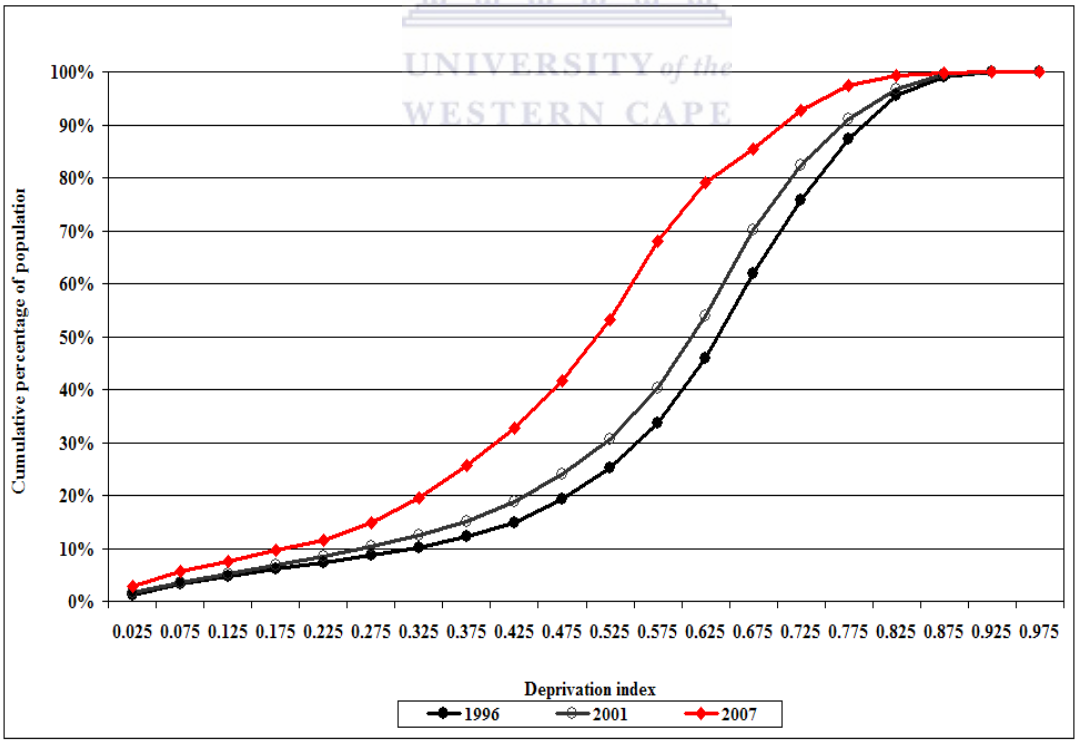
Source: Researcher's own calculations based on Census 1996, Census 2001 and CS 2007 data.

Figure A.18: Cumulative distributive functions in Mpumalanga, 1996 - 2007



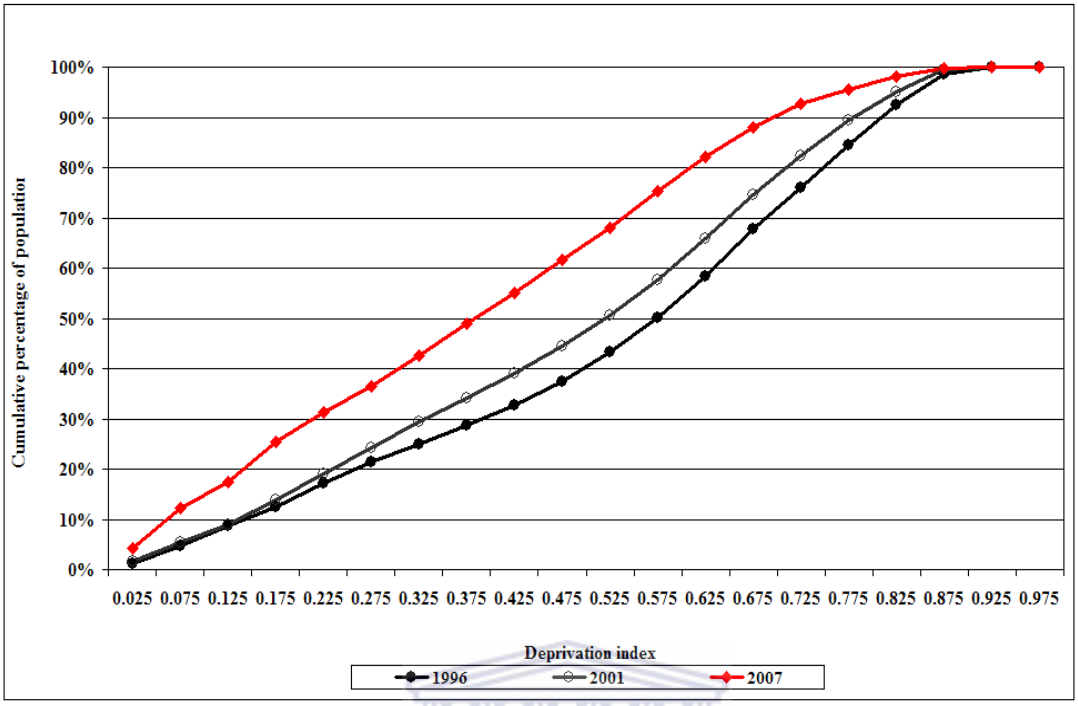
Source: Researcher's own calculations based on Census 1996, Census 2001 and CS 2007 data.

Figure A.19: Cumulative distributive functions in Limpopo, 1996 – 2007



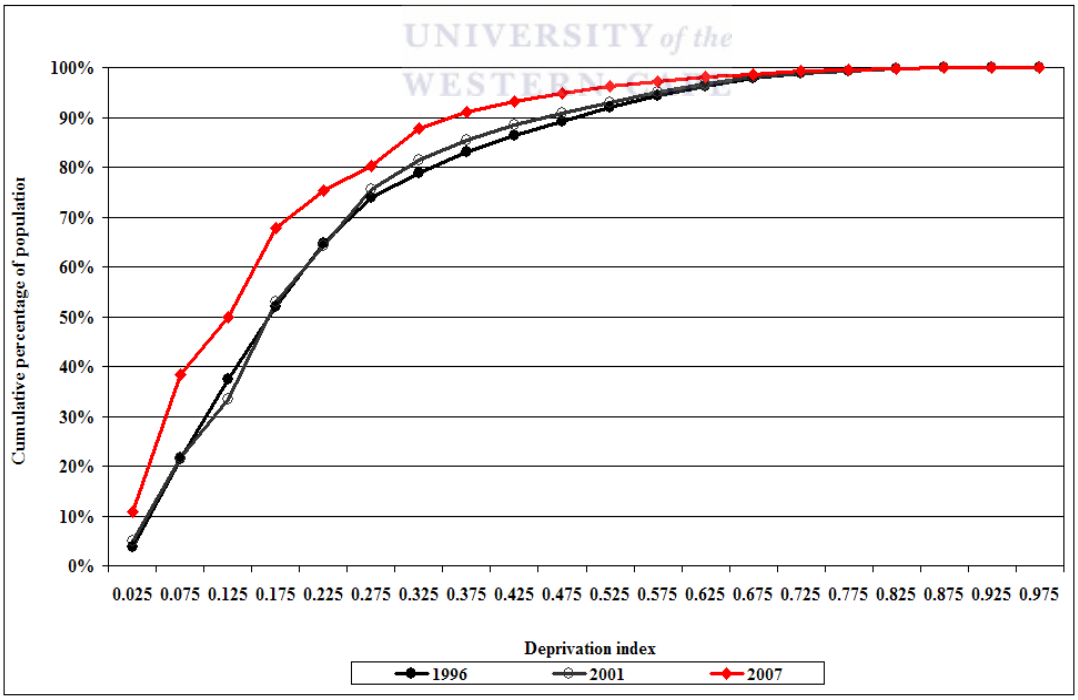
Source: Researcher's own calculations based on Census 1996, Census 2001 and CS 2007 data.

Figure A.20: Cumulative distributive functions of blacks, 1996 - 2007



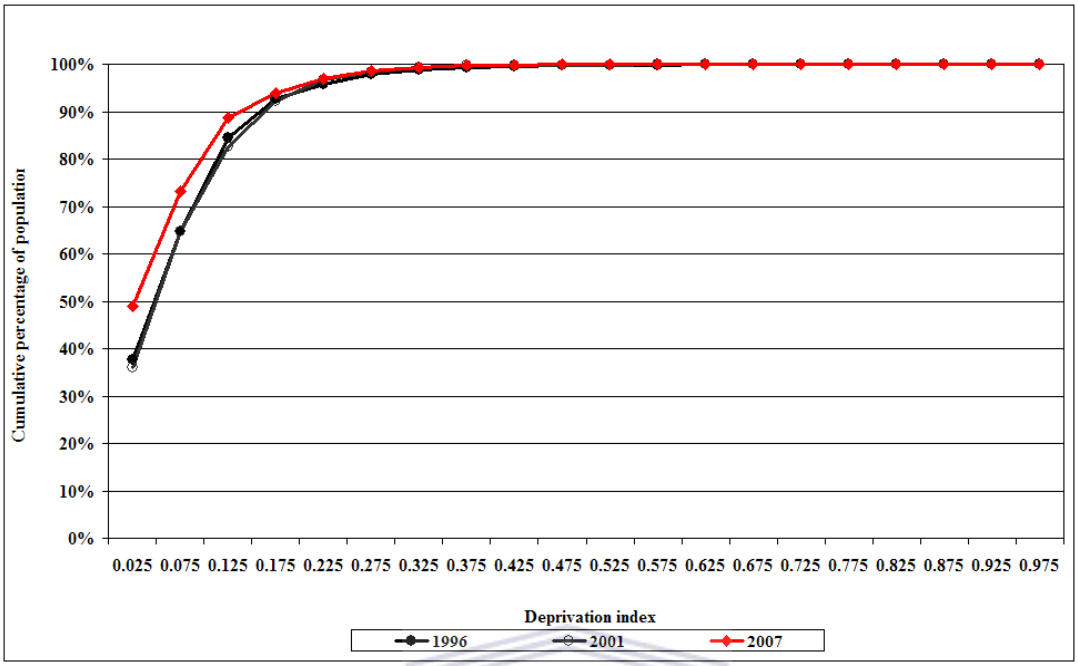
Source: Researcher's own calculations based on Census 1996, Census 2001 and CS 2007 data.

Figure A.21: Cumulative distributive functions of coloureds, 1996 - 2007



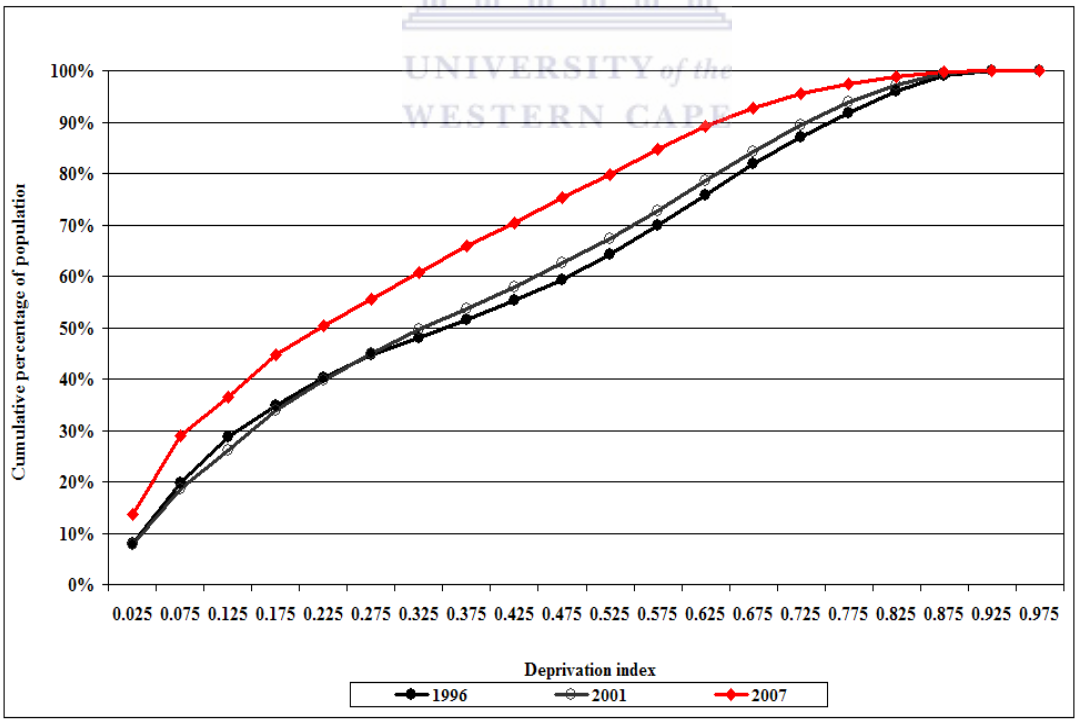
Source: Researcher's own calculations based on Census 1996, Census 2001 and CS 2007 data.

Figure A.22: Cumulative distributive functions of whites, 1996 – 2007



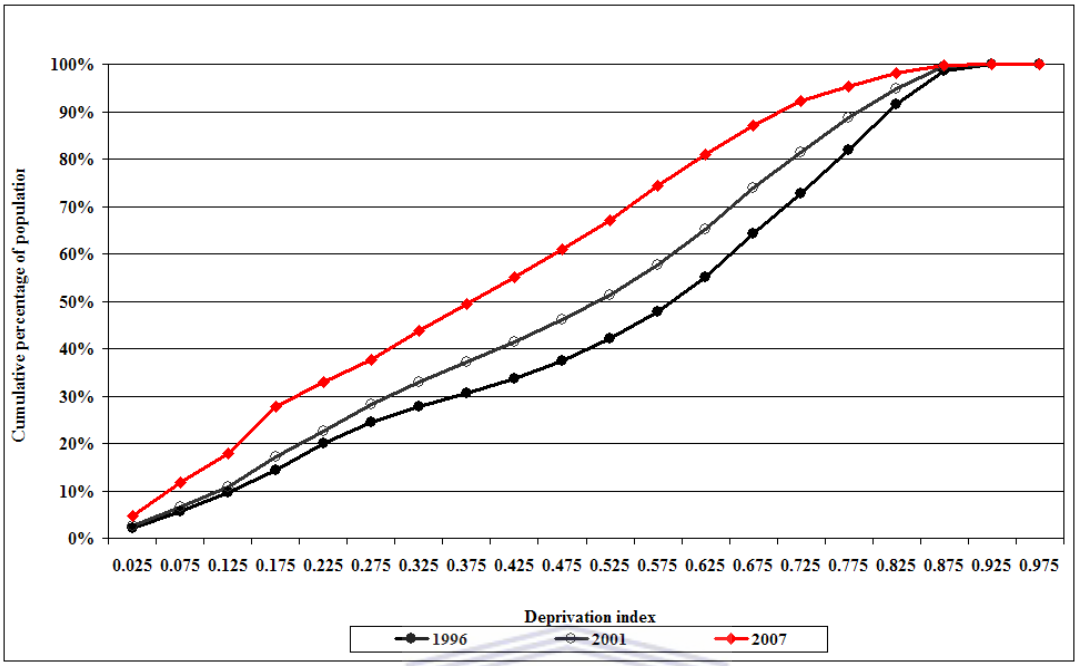
Source: Researcher's own calculations based on Census 1996, Census 2001 and CS 2007 data.

Figure A.23: Cumulative distributive functions of males, 1996 – 2007



Source: Researcher's own calculations based on Census 1996, Census 2001 and CS 2007 data.

Figure A.24: Cumulative distributive functions of females, 1996 – 2007



Source: Researcher's own calculations based on Census 1996, Census 2001 and CS 2007 data.

Table A.10: Comparison between the deprivation index and the annual household income variable, Census 1996

	Deprivation index category										
Household income	**0.0-0.1**	**0.1-0.2**	**0.2-0.3**	**0.3-0.4**	**0.4-0.5**	**0.5-0.6**	**0.6-0.7**	**0.7-0.8**	**0.8-0.9**	**0.9-1.0**	
R0	0.5%	3.0%	6.8%	4.5%	5.3%	10.0%	18.0%	22.8%	25.4%	3.9%	100.0%
R1-R2 400	0.7%	2.5%	4.2%	4.3%	6.6%	13.1%	20.9%	24.0%	21.6%	2.2%	100.0%
R2 401-R6 000	1.0%	4.1%	6.7%	5.8%	7.9%	12.8%	20.4%	21.1%	18.8%	1.5%	100.0%
R6 001-R12 000	2.2%	8.1%	9.7%	8.4%	10.0%	14.1%	18.4%	16.1%	12.1%	0.9%	100.0%
R12 001-R18 000	5.6%	14.9%	13.6%	10.2%	10.9%	13.8%	14.6%	10.0%	6.0%	0.4%	100.0%
R18 001-R30 000	12.2%	22.7%	15.5%	9.3%	9.4%	10.6%	10.2%	6.5%	3.4%	0.2%	100.0%
R30 001-R42 000	24.3%	27.5%	14.7%	7.4%	7.0%	7.3%	6.4%	3.7%	1.7%	0.1%	100.0%
R42 001-R54 000	34.3%	27.7%	13.0%	5.4%	5.0%	5.1%	4.5%	3.1%	1.7%	0.2%	100.0%
R54 001-R72 000	48.1%	25.8%	9.7%	3.7%	3.3%	3.3%	3.0%	1.8%	1.2%	0.1%	100.0%
R72 001-R96 000	57.0%	22.2%	7.6%	3.0%	2.6%	2.6%	2.4%	1.6%	1.0%	0.1%	100.0%
R96 001-R132 000	68.4%	16.7%	4.9%	2.0%	1.8%	1.8%	1.7%	1.5%	1.2%	0.1%	100.0%
R132 001-R192 000	73.5%	14.6%	3.6%	1.8%	1.2%	1.3%	1.6%	1.5%	1.0%	0.1%	100.0%
R192 001-R360 000	73.5%	11.3%	3.5%	1.9%	1.7%	1.8%	2.4%	1.8%	1.9%	0.1%	100.0%
R360 001 or more	62.3%	13.7%	5.2%	1.7%	2.7%	2.9%	4.9%	4.0%	2.4%	0.1%	100.0%
unspecified	16.4%	15.7%	12.2%	7.6%	7.8%	10.3%	12.2%	10.3%	6.8%	0.7%	100.0%

Source: Researcher's own calculations based on Census 1996 data.

Table A.11: Comparison between the deprivation index and the annual household income variable, Census 2001

	Deprivation index category										
Household income	**0.0-0.1**	**0.1-0.2**	**0.2-0.3**	**0.3-0.4**	**0.4-0.5**	**0.5-0.6**	**0.6-0.7**	**0.7-0.8**	**0.8-0.9**	**0.9-1.0**	
R0	0.7%	4.1%	8.6%	8.7%	9.1%	13.2%	19.0%	19.8%	15.7%	1.2%	100.0%
R1-R4 800	1.2%	4.2%	7.2%	8.1%	10.5%	15.9%	21.0%	19.2%	11.9%	0.7%	100.0%
R4 801-R9 600	1.3%	6.2%	9.7%	8.9%	9.9%	13.8%	19.7%	17.8%	12.3%	0.5%	100.0%
R9 601-R19 200	3.7%	11.6%	13.4%	11.2%	11.8%	13.7%	15.8%	11.9%	6.8%	0.2%	100.0%
R19 201-R38 400	11.0%	21.4%	17.3%	11.7%	10.8%	10.1%	9.5%	5.8%	2.3%	0.1%	100.0%
R38 401-R76 800	30.0%	30.5%	14.7%	8.2%	6.1%	4.9%	3.2%	1.8%	0.6%	0.0%	100.0%
R76 801-R153 600	54.4%	26.8%	8.5%	3.7%	2.4%	1.5%	1.3%	0.9%	0.6%	0.0%	100.0%
R153 601-R307 200	73.1%	18.5%	4.3%	1.4%	0.9%	0.6%	0.5%	0.4%	0.2%	0.0%	100.0%
R307 201-R614 400	75.5%	15.1%	3.3%	1.4%	1.0%	1.2%	1.1%	0.9%	0.4%	0.0%	100.0%
R614 401-R1 228 800	71.0%	15.8%	4.4%	1.5%	1.6%	1.4%	1.7%	1.8%	0.9%	0.0%	100.0%
R1 228 801-R2 457 600	36.9%	16.2%	8.7%	4.9%	5.7%	6.0%	7.7%	8.8%	5.2%	0.0%	100.0%
R2 457 601 or more	52.6%	15.6%	6.6%	4.4%	3.2%	3.8%	4.5%	5.7%	3.3%	0.3%	100.0%

Source: Researcher's own calculations based on Census 2001 data.

Table A.12: Comparison between the deprivation index and the annual household income variable, CS 2007

	Deprivation index category										
Household income	**0.0-0.1**	**0.1-0.2**	**0.2-0.3**	**0.3-0.4**	**0.4-0.5**	**0.5-0.6**	**0.6-0.7**	**0.7-0.8**	**0.8-0.9**	**0.9-1.0**	
R0	2.9%	18.5%	9.8%	14.3%	12.3%	13.7%	12.7%	9.1%	6.3%	0.5%	100.0%
R1-R4 800	2.4%	10.7%	9.8%	13.3%	14.2%	16.6%	15.4%	11.0%	6.2%	0.4%	100.0%
R4 801-R9 600	3.8%	9.4%	8.6%	12.3%	13.4%	16.8%	17.6%	11.2%	6.6%	0.3%	100.0%
R9 601-R19 200	5.8%	12.7%	11.3%	12.6%	13.2%	15.3%	14.2%	9.6%	5.3%	0.2%	100.0%
R19 201-R38 400	9.2%	14.2%	11.6%	12.6%	13.0%	14.7%	13.2%	7.5%	4.1%	0.1%	100.0%
R38 401-R76 800	23.0%	21.3%	13.5%	12.0%	9.7%	8.9%	6.8%	3.2%	1.6%	0.0%	100.0%
R76 801-R153 600	47.4%	20.9%	9.1%	7.6%	5.9%	3.7%	3.3%	1.5%	0.7%	0.0%	100.0%
R153 601-R307 200	68.9%	15.9%	5.3%	3.7%	2.2%	1.9%	1.1%	0.6%	0.3%	0.0%	100.0%
R307 201-R614 400	79.2%	10.9%	3.0%	1.9%	1.9%	0.8%	1.1%	0.8%	0.4%	0.0%	100.0%
R614 401-R1 228 800	82.5%	9.5%	2.8%	1.4%	0.8%	0.7%	1.8%	0.3%	0.2%	0.0%	100.0%
R1 228 801-R2 457 600	56.7%	16.3%	3.8%	3.4%	6.3%	5.3%	2.3%	3.6%	2.2%	0.1%	100.0%
R2 457 601 or more	66.2%	9.5%	2.9%	3.1%	3.4%	4.9%	3.9%	3.9%	2.3%	0.0%	100.0%
response not given	35.2%	20.9%	10.9%	9.0%	7.9%	6.8%	5.3%	2.7%	1.3%	0.0%	100.0%

Source: Researcher's own calculations based on CS 2007 data.

Table A.13: Summary statistics of deprivation index by annual household income category, Census 1996

Household income	Minimum	Maximum	Mean	Standard deviation
R0	0.00	1.00	0.66	0.21
R1-R2 400	0.00	1.00	0.65	0.19
R2 401-R6 000	0.00	1.00	0.61	0.21
R6 001-R12 000	0.00	1.00	0.54	0.23
R12 001-R18 000	0.00	0.98	0.44	0.23
R18 001-R30 000	0.00	0.96	0.36	0.23
R30 001-R42 000	0.00	0.94	0.27	0.22
R42 001-R54 000	0.00	0.99	0.23	0.21
R54 001-R72 000	0.00	0.94	0.18	0.19
R72 001-R96 000	0.00	0.91	0.15	0.18
R96 001-R132 000	0.00	0.94	0.12	0.17
R132 001-R192 000	0.00	0.94	0.11	0.16
R192 001-R360 000	0.00	0.93	0.12	0.19
R360 001 or more	0.00	0.94	0.17	0.24
unspecified	0.00	0.99	0.40	0.27
All	0.00	1.00	0.46	0.28

Source: Researcher's own calculations based on Census 1996 data.

Table A.14: Summary statistics of deprivation index by annual household income category, Census 2001

Household income	Minimum	Maximum	Mean	Standard deviation
R0	0.00	1.00	0.59	0.21
R1-R4 800	0.00	1.00	0.58	0.20
R4 801-R9 600	0.00	1.00	0.56	0.22
R9 601-R19 200	0.00	0.98	0.47	0.23
R19 201-R38 400	0.00	1.00	0.35	0.22
R38 401-R76 800	0.00	0.95	0.22	0.18
R76 801-R153 600	0.00	0.92	0.14	0.15
R153 601-R307 200	0.00	0.97	0.09	0.11
R307 201-R614 400	0.00	0.92	0.09	0.14
R614 401-R1 228 800	0.00	0.90	0.11	0.17
R1 228 801-R2 457 600	0.00	0.90	0.30	0.28
R2 457 601 or more	0.00	0.91	0.21	0.25
All	0.00	1.00	0.43	0.26

Source: Researcher's own calculations based on Census 2001 data.

Table A.15: Summary statistics of deprivation index by annual household income category, CS 2007

Household income	Minimum	Maximum	Mean	Standard deviation
R0	0.00	0.98	0.44	0.23
R1-R4 800	0.00	0.97	0.48	0.21
R4 801-R9 600	0.00	1.00	0.49	0.21
R9 601-R19 200	0.00	0.97	0.45	0.22
R19 201-R38 400	0.00	0.98	0.42	0.22
R38 401-R76 800	0.00	0.95	0.30	0.21
R76 801-R153 600	0.00	0.95	0.19	0.19
R153 601-R307 200	0.00	0.92	0.11	0.14
R307 201-R614 400	0.00	0.92	0.09	0.14
R614 401-R1 228 800	0.00	0.87	0.07	0.12
R1 228 801-R2 457 600	0.00	0.91	0.18	0.23
R2 457 601 or more	0.00	0.90	0.17	0.24
response not given	0.00	0.97	0.25	0.21
All	0.00	1.00	0.35	0.24

Source: Researcher's own calculations based on CS 2007 data.