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Exploring Child Poverty and Inequality in Post-Apartheid South Africa: A Multidimensional Perspective

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Abstract

In South Africa, little is known about the multiple forms of deprivation faced by the current generation of young children, and the extent to which they vary across different socio-demographic factors. This paper develops comprehensive child-specific multidimensional poverty measures (Child Multidimensional Poverty Index) employing data from General Household Surveys of 2002 and 2014, and uses these measures to assess change in the Child MPI over time. The measures presented draw on the internationally recognized Alkire-Foster methodology. However, it was adapted to include dimensions, indicators, deprivation cut-offs and weights, which reflect the unique experiences of the current child cohort, aged 0-17 years, in post-apartheid South Africa. The results indicate a reduction in Child MPI over time, from 0.150 in 2002 to 0.090 in 2014. However, the proportion of children who are deprived in at least one-third of some of the weighted indicators, in both time periods, remains high. Over 35% of children were residing in households with an inappropriate dwelling type, and experiencing poor living conditions. Moreover, there is an increase in deprivation relating to the health status of children. The results further indicate a highly unequal distribution of child multidimensional poverty across socio-demographic factors, with the highest levels concentrated in the former homeland areas. The results illustrate the potential usefulness of the Child MPI as a tool for informing and targeting policies and interventions to benefit children.

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1 Introduction

In South Africa, children constitute a considerable proportion (37%) of the population, with about 18.6 million young people between the ages of 0 and 17 years (Hall and Meintjes, 2016; Hall et al., 2014; UNICEF et al., 2011*a*). Based on the evidence, poverty and inequality are more prevalent among this cohort than any other age group, because they are usually the most vulnerable in the households or society (Alliance for Children's Entitlement to Social Security, 2002; Triegaardt, 2006; UNICEF et al., 2011*b*; Von Fintel et al., 2015). Between 1995 and 1999, it was estimated that the rate of child poverty (calculated on a poverty line of R400.00/month per capita) in South Africa increased by 11.1%, while the rate of children in dire poverty (calculated on a poverty line of R200.00/month per capita) increased by 19.2% during the same period. In 2002, 11 million children were living in dire poverty, and recent statistics show that 11.9 million children (64% of all children) live in income poverty (Alliance for Children's Entitlement to Social Security, 2002; UNICEF et al., 2011*a*,*b*).

Poverty experienced by the majority of young children is often attributed to deprivation suffered at the household level or by their parents (Frame, De Lannoy, Koka, Leibbrandt et al., 2016; Frame, De Lannoy and Leibbrandt, 2016; Von Fintel et al., 2015). These deprivations are not just about a lack of money to meet basic needs, but also about social exclusions and deprivation in multiple dimensions of well being. These include restricted access to social services, low levels of education, poor health, higher incidence of ill-health and chronic diseases, poor living standards, high exposure to social vices and lack of employment, amongst others. In fact, the notion that poverty is inherently multi-dimensional has now become well-established in the academic and policy-oriented literature (Decancq and Lugo, 2013; Frame, De Lannoy and Leibbrandt, 2016; Maasoumi and Nickelsburg, 1988; Sen, 2011; Stiglitz et al., 2010). In South Africa, evidence suggests that the current child cohort actually faces multiple forms of deprivation (Frame, De Lannoy and Leibbrandt, 2016; Von Fintel et al., 2015).

In a bid to reduce multiple forms of deprivation and inequality confronting vulnerable children in the post-apartheid era, the South African government embarked on a number of national child development policies and interventions with emphasis on nutrition, child health, water and sanitation, early childhood development and basic education, social welfare development (family environment, out-of-home care and social security) child protection measures against violence, sexual assault and crimes, amongst others (The National Plan of Action for Children (NPAC)).

The broad theme of the NPAC includes child survival, child development, protection and care for children, standard of living of children and child participation. With the NPAC and other policies[1] in place, coupled with the government's commitment to various child rights as explicitly stated in South Africa's Constitution (see South Africa Constitution, 1996, Section 28(1)(a)), it is expected that newer cohorts of children would have better access to resources and opportunities than older cohorts, since Apartheid denied many such resources and opportunities (Frame, De Lannoy, Koka, Leibbrandt et al., 2016).

To summarise, a large number of children live in households that experience material deprivation, and many children are exposed to violence, malnutrition, insecurity, poor health and schooling (UNICEF et al., 2011*a*,*b*). The subsequent effective implementation and review of national policies to tackle child poverty and inequality will require a comprehensive consideration of these multiple, co-existing deprivations in young children's lives, especially with regard to how they differ across different dimensions of deprivation and socio-demographic factors. However, there is currently little understanding about the multiplicity of deprivation faced by young children in South Africa.

Importantly, little empirical analysis shows the extent to which child multidimensional poverty has changed over time. In fact, multidimensional poverty and inequality among children has not received all that much attention. Reviews of the poverty literature suggest that a number of studies have examined multidimensional poverty at a fairly aggregate level (Adams et al., 2013; Alkire et al., 2016; Alkire and Santos, 2010; Alkire and Seth, 2008; Bhorat and van der Westhuizen, 2013; Bhorat et al., 2007, 2009; Burger et al., 2004; Finn, Leibbrandt and Woolard, 2013; Finn, Leibbrandt et al., 2013; Jansen et al., 2015; Leibbrandt et al., 2006, 2010; Noble et al., 2010; Statistics South Africa, 2014*b*). For instance, Statistics South Africa (2014*b*) applied the Alkire-Foster method to construct the South African Multidimensional Poverty Index (SAMPI) for the national aggregate. Only a few studies have investigated the multidimensional nature of young people's deprivation in South Africa (Frame, De Lannoy, Koka, Leibbrandt et al., 2016; Frame, De Lannoy and Leibbrandt, 2016; Von Fintel et al., 2015). With respect to these recent studies, Frame, De Lannoy, Koka, Leibbrandt et al. (2016) and Frame, De Lannoy and Leibbrandt (2016) apply the Alkire-Foster Multidimensional Poverty Index methodology to National Census 2011 data to develop a youth-specific multidimensional poverty measure that

[1]These policies include but are not limited to the following: child support grant, child protection, national early childhood development (ECD), abolition of user fees for children at primary health care (PHC) facilities and school feeding programmes.

can be spatially analysed. The results indicate highly unequal youth multidimensional poverty between local municipalities. Further analysis indicates that 72% of multi-dimensionally poor youth are deprived in educational attainment. However, this analysis is cross-sectional, so cannot uncover changes over time, while its focus was on young people between the ages of 15 and 24. Our research adapts Frame, De Lannoy, Koka, Leibbrandt et al. (2016) to measure the nature and extent of multidimensional poverty among the children aged 0-17 years. Furthermore, we extend the time dimension to the post-apartheid period in South Africa, and we compare its distribution across key dimensions, indicators and socio-demographic factors.

Hence, the empirical contribution of this research is three-fold. Firstly, we develop comprehensive child-specific multidimensional poverty measures (Child Multidimensional Poverty Index (Child MPI)) for 2002 and 2014, and use these measures to assess the change in the Child MPI over that time period. This is with a view to measuring the overall progress in Child MPI over time. The Child MPI is based on the method developed by Alkire and Foster (Alkire-Foster 2011). Secondly, we examine the contributions of the different dimensions and indicators to the change in the Child MPI. Thirdly, we decompose the Child MPI across key socio-demographic factors in order to show the characteristics of the Child MPI for each factor over time. Our analysis pays particular attention to the health dimension, given the high rates of mortality and morbidity experienced by young South African children (Bradshaw et al., 2003). We apply the Alkire-Foster method to the population-weighted General Household Surveys (GHS) of 2002 and 2014. The initial survey was the first GHS conducted, while the latter survey is a more recent survey that is available, thus allowing for comparison of the Child MPI between the two years.

We find that, although progress has been made in reducing child multidimensional poverty in South Africa, the incidence of deprivation remains high (over 30%) in some of the weighted indicators. Over 35% of children were residing in households with an inappropriate dwelling type, and experiencing poor living conditions. Moreover, the incidence of deprivation relating to health status of children increased. Further investigation suggests that deprivation associated with household economic activities contributes the highest share to the overall Child MPI, while there is an unequal distribution of child multidimensional poverty across socio-demographic factors.

2 Methodology

There are a number of methods available to measure multiple non-income deprivations experienced by the poor. Most South African studies have adopted either the asset-based or composite indices approach to measure poverty or multiple deprivation (Bhorat and Van der Westhuizen, 2010; Finn, Leibbrandt et al., 2013; Leibbrandt et al., 2006; Leibbrandt and Woolard, 2006; Van der Berg et al., 2008; Yu, 2009; **?**). However, attention is shifting towards multidimensional poverty measures. For instance, Statistics South Africa used the Alkire-Foster method to construct the South African Multidimensional Poverty Index (SAMPI) (Statistics South Africa, 2014*b*). In like manner, Frame, De Lannoy and Leibbrandt (2016) adopted the same method to construct the Youth MPI. Furthermore, Burger et al. (2004) used the totally fuzzy and relative indices of poverty to consider the spatial dimensions of poverty and deprivation in South Africa. However, the Alkire-Foster method is widely acknowledged, because it surmounts some of the drawbacks of the earlier mentioned methods. Also, it expresses the joint distribution of deprivations (Alkire et al., 2015; Frame, De Lannoy and Leibbrandt, 2016).

The Alkire and Foster (2011) method is an approach for measuring multidimensional poverty, which takes into consideration the multiple forms of deprivations experienced by poor individuals at any given point in time. Fundamentally, the method involves counting the number of deprivations each individual simultaneously experiences across multiple dimensions of well-being. As explained earlier, the methodology has a flexible structure, which can be adapted to other specifications (Santos and Alkire, 2011); the dimensions, indicators, cut-offs, weights and unit of analysis can be determined by the user. In this way, the Alkire-Foster method essentially offers a basic framework upon which certain modifications can be made to better address the realities and requirements in particular contexts (Frame, De Lannoy and Leibbrandt, 2016).

To apply the Alkire-Foster methodology, it is necessary to determine the unit of analysis, identify the set of indicators in which each person is deprived simultaneously and summarise their poverty profile in a weighted deprivation score. Individuals are identified as multidimensionally poor if their deprivation score exceeds a cross-dimensional poverty cut-off. The proportion of poor individuals (censored headcount ratio or incidence of poverty) and their average deprivation score (i.e. the intensity of poverty or percentage of simultaneous deprivations they experience) become part of the final poverty measure (Alkire et al., 2016; Santos and Alkire, 2011). Our empirical analysis strictly follows the Alkire-Foster method (Alkire and

Foster, 2011) to explore the nature and extent of multidimensional poverty among very young children in post-apartheid South Africa. In the subsequent section, we describe the data used for our analysis, and step-by-step techniques involved in the construction and decomposition of the Child MPI.

2.1 Data and Unit of Analysis for the Child MPI

Data for the analysis was sourced from the 2002 and 2014 General Household Surveys (GHSs); each survey is nationally representative, and contains information on housing services, social services, household tourism activities, labour markets, and socio-economic information relating to education, living standards, health and other health-related behaviour of the South African population. In each survey, approximately 30,000 South African households are interviewed, and the survey, which started in 2002 is conducted annually. To account for differences in survey designs, which cannot be entirely avoided, we employ the sampling weights provided in the datasets (Statistics South Africa, 2014*a*).[2]

Using two datasets opens the door for comparison of multidimensional poverty among children, because they are both nationally representative. In addition, the datasets comprise information on key dimensions and indicators required for constructing the Child MPI. Moreover, the datasets measure respondents' outcomes in similar manner. Socio-demographic information that is consistent in both surveys and relevant for the analysis of the Child MPI include gender, race, province and urban/rural setting. For each of the surveys, individual-level information were merged with the household-level information. After refusals and non-responses were ignored, the resultant samples of children were 40,006 and 35,651 in 2002 and 2014, respectively. As opposed to the SAMPI and Youth MPI, the unit of our analysis is young children aged 0-17 years[3]. Distinguishing children from the household allows us to select indicators and deprivation cut-offs that reflect the distinct circumstances of the South African child cohort of interest.

[2]The GHS datasets are publicly available and can be accessed from `https://www.datafirst.uct.ac.za/dataportal/index.php/catalog/526/get_microdata`. For details on the derivation of the GHS weights and other adjustments made in the datasets, see the respective survey metadata files and technical notes sections of the statistical releases – `https://www.datafirst.uct.ac.za/dataportal/index.php/catalog`.

[3]This paper follows the generally-acceptable international definition of children as individuals aged 0-17 years.

2.2 Description of the dimensions, indicators and deprivation cut-offs of the Child MPI

The Child MPI is composed of 18 indicators across four dimensions: education, health, living condition and economic activity. Each of the indicators is associated with a minimum level of satisfaction, called deprivation cut-offs, which define whether a child is deprived in that particular indicator. The dimensions selected are similar to those of the SAMPI and Youth MPI. However, the indicators and deprivation cut-offs were modified to capture some conditions that are peculiar to the young South African children. The selection of the dimension, indicators and cut-offs are based on international agreements such as Sustainable Development Goals (SDGs), and national documents, which include the National Plan of Action for Children (NPAC), theoretical frameworks and participatory processes of young South Africans (Alkire et al., 2016; Alliance for Children's Entitlement to Social Security, 2002; Frame, De Lannoy and Leibbrandt, 2016). Formally, if we assume that the typical indicators' deprivation cut-offs are noted as y_j, then a child j is considered deprived if his/her achievement in an indicator, say x_j is below the deprivation cut-off, i.e if $x_j < y_j$. A complete description of the dimensions, indicators, their respective weights and deprivation cut-offs are outlined in Table 1.

Table 1: Description of the Dimensions, Indicators, Deprivation Cut-offs and Weights of the Child MPI.

Dimension (weight)	Indicator (weight)	Deprived if...
Living conditions ($\frac{1}{4}$)	Electricity ($\frac{1}{44}$)	A young child is living in a household that does not have electricity
	Water ($\frac{1}{44}$)	A young child is living in a household that does not use improved drinking water sources from pipe/tap/boreholes on site, or the distance to the nearest water source takes at least 15 minutes. In essence, water source is unprotected well, spring and river/lake/pond
	Sanitation	A young child is living in a household that does not use improved sanitation/toilet facilities such as flush toilet, and the toilet facility is shared or the distance to the nearest toilet facility takes at least 2 minutes
	Refuse collection	A young child is living in a household where refuse are removed less often than a week or there is no concrete refuse removal system
	Fuel for cooking/heating/lighting	A young child is living in a household that is using solid fuel such as paraffin/candles/nothing/other for cooking/heating/lighting
	Dwelling type	A young child is living in a household that is an informal shack/traditional dwelling/caravan/tent/other

Continued on next page...

Dimension (weight)	Indicator (weight)	Deprived if...
	Walls	A young child is living in a household that does not use standard materials such as bricks, cement, tiles for the walls and the condition of the walls are deplorable
	Roofs	A young child is living in a household that does not use standard materials such as corrugated iron, asbestos, tiles for the roofs and the condition of the roofs are in a bad state
	Overcrowding	A young child is living in an overcrowded house. Overcrowding is obtained by dividing the household size by the total number of rooms available in the house (excluding kitchen and bathrooms). if the value obtained is greater than two, then a child is considered to be living in crowded house.
	Assets	A young child is living in a household that owns zero or one of the following assets; television, radio, telephone, cell phone, fridge, bicycle, AND the household does not own a vehicle. Household is not deprived in assets if it owns at least a house (fully or partially-paid), one of the assets for access to information (phone (mobile or fixed), radio, TV) AND either one asset for easy mobility (bicycle, motorbike, motorboat, car/truck or animal wheel cart) OR one asset for livelihood (refrigerator, agricultural land or livestock (at least one cow or at least one horse or at least two goats or at least two sheep, or at least 10 chickens)
	Child support grant access	A young child has lost either or both parents, and lives in a household where total household consumption/expenditure is less than R400 per month or there is no income, and that child is not a recipient of child support grant
Education ($\frac{1}{4}$)	School attendance ($\frac{1}{8}$)	A child of school-going age (7-15 years old) is not attending school. According to the South African Schools Act of 1996, education is compulsory for all South Africans between the ages of 7 and 15.
	Years of schooling ($\frac{1}{8}$)	A child lives in a household where no member has at least five years of education
Health ($\frac{1}{4}$)	Ill-health ($\frac{1}{16}$)	Young children aged 0 - 17 years who are ill could not seek medical care due to inability to pay for health care services, distance to health care facilities and other socio-economic reasons
	Disability ($\frac{1}{16}$)	Young children aged 0 - 17 years who are severely disabled are not currently attending school, and they are not on care dependency grant
	Hunger ($\frac{1}{16}$)	A young child aged 0-17 years, in a household, has to go to bed hungry because there was insufficient food in the house
	Homelessness ($\frac{1}{16}$)	A young child aged between 7-15 years is living on the street
Economic activity ($\frac{1}{4}$)	Unemployment rate ($\frac{1}{4}$)	Young children aged 0 - 17 years are living in a household where no working-age adults (aged 18 to 64) are employed, and no member of the household is on any social grant

Adapted from Frame, De Lannoy and Leibbrandt (2016)

Below is a brief definition of some of the indicators and deprivation cut-offs in the Child's

MPI dimensions.

- Education: Education consists of two complementary indicators, years of schooling and school attendance. The indicators are derived from the individual-level information on highest level of education completed and current school attendance. These indicators consider the educational status of each child and other family members including that of the parent(s). The indicators' cut-offs are designed to take into account the levels in the South African educational system. Each of the indicators is equally weighted at $\frac{1}{8}$.

- Health: Given the rates of burden of disease, child mortality and morbidity in South Africa, health is considered a key dimension in the Child MPI. Information available in the GHS relate to morbidity (ill-health and disability), reasons for not seeking medical care when ill, access to disability grant, hunger and homelessness. The latter two indicators are considered under the health dimension because children who constantly experience hunger and live in the street are susceptible to health problems. These indicators have also been found to be precursors for child mortality (Appels et al., 1996; Hart-Shegos, 1999; Harttgen and Misselhorn, 2006). Subsequently, the health dimension comprises the four indicators outlined in Table1. Each of the indicators is equally weighted at $\frac{1}{16}$.

- Economic activity: This dimension comprises a single indicator, household unemployment. Children who live in households where working-age adults are unemployed and not on social grants are most likely to suffer multiple deprivations, as there will be limited resources to to meet basic needs. The indicator is weighted at $\frac{1}{4}$.

- Living conditions: The living condition indicator considers the main aspects of young children's household circumstances that impact their general well-being. This dimension is composed of eleven household-level indicators. The indicators were selected to reflect contextual environmental circumstances in which young South African children live. Each of the eleven indicators is weighted at $\frac{1}{44}$.

2.3 Description of the weights and the poverty cut-off

The Child MPI adopts the Youth MPI nested weighting structure. In the Child MPI, the four dimensions are equally weighted[4], so that each of them receives a $\frac{1}{4}$ weight. Similarly, the

[4]Complex weighting structure are difficult to interpret while equal weight ease the interpretation of the poverty index and reflects the normative assessment that each dimension is equally important in determining overall well-being (Frame, De Lannoy and Leibbrandt, 2016; Santos and Alkire, 2011)

indicators within each dimension are equally weighted. Basically, these weights show the relative importance of each of the dimensions and indicators in determining the overall multidimensional poverty index. For instance, the indicator in the economic activity dimension is weighted at $\frac{1}{4}$ while each indicator within the health dimension receives a $\frac{1}{16}$ weight. This implies that if the number of indicators in a dimension is changed, the weights will have to be adjusted accordingly. We denote the indicator j weight as w_j such that:

$$\sum_{j=1}^{n} w_j = 1 \qquad j = \{1, 2, 3, ..., n\}. \tag{1}$$

Each child is assigned a deprivation score according to his/her deprivations in the component indicators. The deprivation score of each child is calculated by taking a weighted sum of the number of deprivations, so that the deprivation score for each child lies between 0 and 1. The score increases as the number of deprivations of the child increases and reaches its maximum of 1 when the child is deprived in all component indicators. A child, who is deprived in any indicator, receives a score equal to 1, such that:

$$c_j = w_1 D_1 + w_2 D_2 + w_3 D_3 + ... + w_n D_n \tag{2}$$

$D_j = 1$ if the child is deprived in indicator j and $D_j = 0$, otherwise, while w_j is the weight attached to indicator j with $\sum_{j=1}^{n} w_j = 1$

On the other hand, the poverty cut-off identifies whether a child is multi-dimensionally poor based on his/her total weighted deprivation. In other words, it is the share of weighted deprivations a child must have in order to be considered poor, and we denote it with p. Thus, a child is considered poor if his/her deprivation score is equal or greater than the poverty cut-off i.e a child is poor if $c_j \geq p$. The Child MPI adopts a poverty cut-off of $\frac{1}{3}$ (33.33%) following the Alkire-Foster MPI, SAMPI and Youth MPI. Thus, a child is multi-dimensionally poor if he/she has a deprivation score higher than or equal to $\frac{1}{3}$, i.e if a child is deprived in a third or more of the weighted deprivations. For children with a deprivation score that is below the poverty cut-off, even if it is non-zero, it is replaced by a '0'. This is referred to as censoring in poverty measurement.

Using the notation $c_j(z)$ for the censored deprivation, such that when $c_j \geq z$, then $c_j(z) = c_j$, but if $c_j < z$, then $c_j(z) = 0$; thus, $c_j(z)$ is the deprivation score of the poor. As with the weights, the choice of poverty cut-off is also flexible in the Alkire-Foster method, depending on

the particular context. In particular, the choice of a poverty cut-off of $\frac{1}{3}$ is rather arbitrary. However, a robustness test undertaken on a range of alternative poverty cut-offs suggests that the choice of poverty cut-off would not significantly alter the poverty rankings across socio-demographic factors of interest.

2.4 Computation of the Child MPI

There are two key steps to computing the Child MPI, when applying the Alkire-Foster method. These steps are identification and aggregation. The identification step determines which children are multi-dimensionally poor. As explained earlier, this involves applying two sets of cut-offs. The first set are the indicators' minimum level of satisfaction or deprivation cut-offs, which are applied to each indicator to determine whether an individual is deprived in that particular indicator. Subsequently, the number of (weighted) deprivations experienced across all indicators are added up for each individual child. Then the second cut-off, namely the poverty cut-off, is applied, which specifies that if a young child is deprived in a third or more of the total weighted deprivations, he or she is considered multi-dimensionally poor.

As soon as the multi-dimensionally poor children are identified, the final aggregation step involves generating a set of three poverty measures. The first is the headcount ratio, obtained as the proportion of children who are multi-dimensionally poor. The second measure is the intensity or breadth of poverty, calculated as the average proportion of indicators in which poor children are deprived. The third measure is the Child MPI, also referred to as the adjusted headcount ratio. This index is simply the product of the headcount ratio and the intensity of poverty among children. It ranges from zero (0) to one (1), where 0 means none of the children are deprived in all indicators, and 1 otherwise. A major benefit of the adjusted headcount ratio introduced in the Alkire-Foster method is that it provides information on both the incidence and intensity of deprivation suffered, which are not often reflected in traditional headcount measures. This kind of information is particularly important for the design of specific policies and interventions.

The Child MPI, thus, is the combination of the incidence of children who experience multiple deprivations and the intensity of their deprivation. Formally, the first component is called the child multidimensional headcount ratio (H) which is expressed as:

$$H = \frac{m}{N} \tag{3}$$

m is the number of children who are multi-dimensionally poor and N is the total population of children. The second component refers to the intensity of poverty (A). It is the average deprivation score of the multi-dimensionally poor children, expressed as:

$$A = \frac{\sum_{j=1}^{n} c_j(z)}{m} \tag{4}$$

$c_j(z)$ is the censored deprivation score of child j. Mathematically, the Child MPI is the product of H and A, i.e Child MPI $= (H * A)$

2.5 Decomposition of the Child MPI

One convenient feature of the MPI is that it can be decomposed by population sub-groups, such as gender, race, geographical location, etc. Decomposability of the MPI is a key property for policy as it reflects the characteristics of the multidimensional poverty for each group. The MPI can also be decomposed into its component dimensions and censored indicators. Formally, the MPI decomposition can be expressed as:

$$MPI(x, y; z) = \frac{n(x)}{n(x, y)} MPI(x; z) + \frac{n(y)}{n(x, y)} MPI(y; z) \tag{5}$$

$n(x)$ is the number of individuals in x (and similarly for $n(y)$ and $n(x, y)$

In this paper, we decompose the Child MPI by the socio-demographic factors: gender, race, province, and rural/urban setting. For instance, decomposing the Child MPI by gender yields:

$$DMPI_{child_{gender}} = \frac{n_m}{n} MPI_m + \frac{n_f}{n} MPI_f \tag{6}$$

m denotes males while f stands for females, and $\frac{n_m}{n}$ is the proportion of males in the total population (and similarly for $\frac{n_f}{n}$ (assuming that $n_m + n_f = n$). Subsequently, the contribution of each factor to the overall Child MPI follows:

$$CMPI_{child_{gender}} = \frac{\frac{n_m}{n} MPI_m}{MPI_{child}} * 100 \tag{7}$$

In like manner, the decomposition of the Child MPI into its component censored indicators can be computed using:

$$DMPI_{child} = \sum_{j=1}^{n} w_j CH_j \qquad j = \{1, 2, 3, ..., n\}. \tag{8}$$

w_j is the weight of indicators j, CH_j is the censored headcount ratio of indicators j and $\sum_{j=1}^{n} w_j = 1$. Similarly, the contribution of each indicator to the overall child poverty measure becomes:

$$CMPI_{child} = \frac{w_j CH_j}{MPI_{child}} * 100 \tag{9}$$

3 Limitations of the study

Unfortunately, the selection of the dimensions and indicators for the Child MPI was constrained by the data available in the GHS (and its similarity over time). Subsequently, the computation of the Child MPI was constrained by the rather limited range of child-relevant survey items included in the questionnaire. Ideally, a measure of multidimensional poverty for children would include indicators that capture deprivations relating to, for example, safety and violence, quality of early childhood and basic education, mortality, nutrition and other anthropometric information. However, the GHSs do not contain data for these and other relevant child indicators. Therefore, we consider the lack of complete and consistent information on health and early childhood education to be a key constraint. Moreover, the GHSs do not provide uniform information on mortality, nutrition and early childhood education across the survey years. As a result, the Child MPI computed here presents a limited assessment of these indicators, although it is the best one available at this point.

4 Robustness Check

Santos and Alkire (2011) recommend performing robustness checks on the choice of weights and the poverty cut-off. There are implicit value judgments involved in these choices, and robustness checks are a way to verify whether these decisions affect the results. As stated earlier, the Child MPI has a structure of nested weights, in which each dimension is equally weighted, and each indicator within a dimension is also equally weighted. To test whether the Child MPI is robust to variations in its weighting structure, the measure was re-estimated with three alternative weighting structures, giving 40% of the relative weight to one dimension and

20% to each of the remaining three in turn. With these in hand, rankings between provinces were built for each, along with the original equal weight estimate. Rank correlation coefficients were computed across these scenarios. Table A.1 and A.3 in the appendix present the correlation coefficients between the provinces' rankings derived from the Child MPI with equal weights and those derived from the three alternatives, in both time periods considered. The correlation between the equal weight estimate and the three alternatives is 0.943 or higher using the Pearson correlation coefficient. The results indicate that while changes in the weights affect the size of the poverty estimates produced by the Child MPI, they do not significantly alter the relative position of each province with respect to the others, implying that the rankings produced by the Child MPI (between provinces) are robust to variations in its weighting structure.

It is also possible that a limit above or below $\frac{1}{3}$ (or 33.33%) would change the province rankings, and influence the results. To test whether the Child MPI is robust to variations in this cut-off, the measure was estimated for a reasonable range of poverty cut-offs, from 30-80%. A robustness check, with similar range, was performed in Alkire et al. (2010) and Santos and Alkire (2011). Again, provincial rankings were built for each estimate and rank correlation coefficients were computed across the estimates. Table A.2 and A.4 in the appendix present the correlation coefficients between each scenario of rankings. The minimum correlation between the estimate with a poverty cut-off of 30% and that of 80% is 0.786. While changes in the poverty cut-off inevitably affect the incidence rates, the results suggest that the rankings of the Child MPI between provinces are also robust to changes in the poverty cut-off.

5 Results

5.1 Estimates of the Child MPI

Bearing in mind that the Child MPI reflects both the incidence (H) and average intensity (A) of poverty among children, we begin our presentation with the estimates of the Child MPI in the two time periods (see Table 2). Comparing the estimates in both time periods, the headcount ratio (H) indicates that approximately one in three (32.8%) children in South Africa were multi-dimensionally poor in 2002. However, there is a decrease (22.2%) in the proportion of children who were multi-dimensionally poor in 2014. Similarly, on average, the intensity of poverty (A) fell from 45.9% to 40.7% in 2002 and 2014, respectively. Combining these two measures gives an overall Child MPI, or adjusted headcount ratio (M0), of 0.150 and 0.090 in 2002 and 2014,

respectively. As expected, given H and A, a smaller proportion of children were MPI poor in 2014 relative to 2002, and the average intensity of multidimensional poverty among children is also relatively low. Although the values of the multidimensional poverty measures are quite high, we find that progress has been made. However, it should be noted that these estimates cannot be directly compared to either the SAMPI or Youth MPI, because the Child MPI differs with regard to its unit of analysis and its construction of indicators.

Table 2: **The Child MPI for 2002 and 2014 in South Africa, GHS Data**

	2002				**2014**			
	Co-efficient	s.e	95% CI		Co-efficient	s.e	95% CI	
Headcount ratio (H)	0.328	(0.003)	0.321	0.334	0.222	(0.004)	0.214	0.230
Intensity (A)	0.459	(0.001)	0.457	0.461	0.407	(0.001)	0.405	0.410
Child MPI (H*A)	0.150	(0.002)	0.147	0.154	0.090	(0.002)	0.087	0.094

[a] Source: Authors' calculations based on weighted data from GHS 2002 and 2014.

[b] Number of observations in 2002 and 2014 are 40,006 and 35,651 respectively

[c] H is the percentage of poor people, while A is the average intensity across the poor

5.1.1 Incidence of Deprivation in Each of the Child MPI Indicators

In pursuance of the first objective of this paper, we continue the analysis of the Child MPI by looking at its two components in detail. The first component we consider is the incidence of deprivation among children in both time periods. Figure 1 reports the proportion of children that are poor and deprived in each indicator of the Child MPI over time. The striking feature about Figure 1 is the relatively high proportion of vulnerable children deprived in access to the child support grant. In 2002, about 70% of vulnerable children were deprived of access to child support grant, while only 14% were deprived in 2014. Presumably, this reduction can be attributed to the government's commitment to widen the scope of coverage of the child support grant over time. The child support grant currently has the highest percentage share of the total number of social security beneficiaries, with a coverage of over ten million children each month (Brynard, 2006; Heinrich et al., 2012; UNICEF et al., 2014). Moreover, there is a reduction over time in the proportion of children living in households with poor living conditions relating to water, electricity, asset ownership, overcrowding, housing, cooking /heating/lighting fuel and sanitation. In like manner, except for deprivations relating to ill-health and years of schooling which increase over time, the proportion of children deprived of school attendance reduced. In particular, the proportion of children suffering from deprivation associated with

ill-health is higher in slightly 2014 (11%), than in 2002 (7%). However, in both time periods, the incidence of deprivation was more than 30% in five of the eighteen indicators that were considered. The affected indicators have to do with the living conditions of children, particularly housing-related conditions. We observe that over 35% of children were living in households with an "inappropriate" dwelling type (having poor roof and wall conditions), poor toilet facilities and sanitation in both 2002 and 2014, even though the proportion of children who were deprived in these indicators reduced over time.

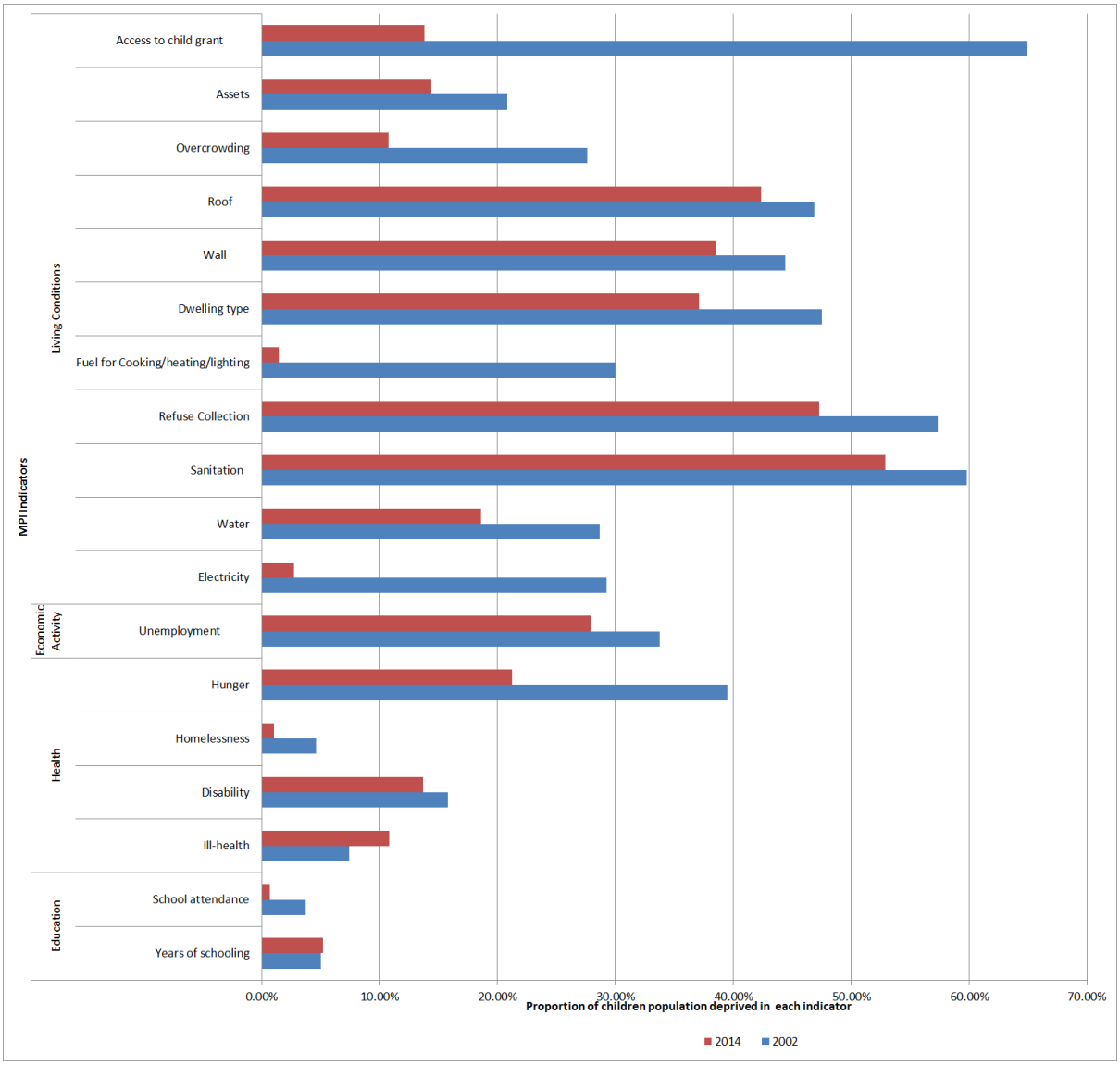

Figure 1: Censored deprivations in each indicator in 2002 and 2014, GHS data

In general, we observe that progress has been made in reducing the incidence of deprivations linked to hunger, homelessness, school attendance and access of vulnerable children to child support grants in South Africa. However, more needs to be done in order to reduce the incidence of deprivation that has to do with the conditions in which children live, levels of education of

household members, and in particular, the health status of children in South Africa.

5.1.2 Intensity of Child MPI

Furthermore, we consider the intensity of deprivation among children in both time periods. As explained earlier, the intensity of poverty denotes the proportion of weighted indicators in which children are deprived. Further, a child is considered to be MPI poor if he/she is deprived in at least one third (33.33%) of the weighted indicators. Consequently, a child who is deprived in 80% of the weighted indicators has a greater intensity of deprivation than a child deprived in 50% of the weighted indicators. Figures 2 breaks down the children into different categories based on the intensity of their deprivations in 2002 and 2014. It depicts the proportion of children that are poor in certain percentage of weighted indicators or more. For instance, the value over the 40%+ bar represents the percentage of people who are deprived in 40% or more weighted indicators. In both time periods, those who are deprived in 50% or more of the indicators are identified to be in "Severe poverty' (Santos and Alkire, 2011).

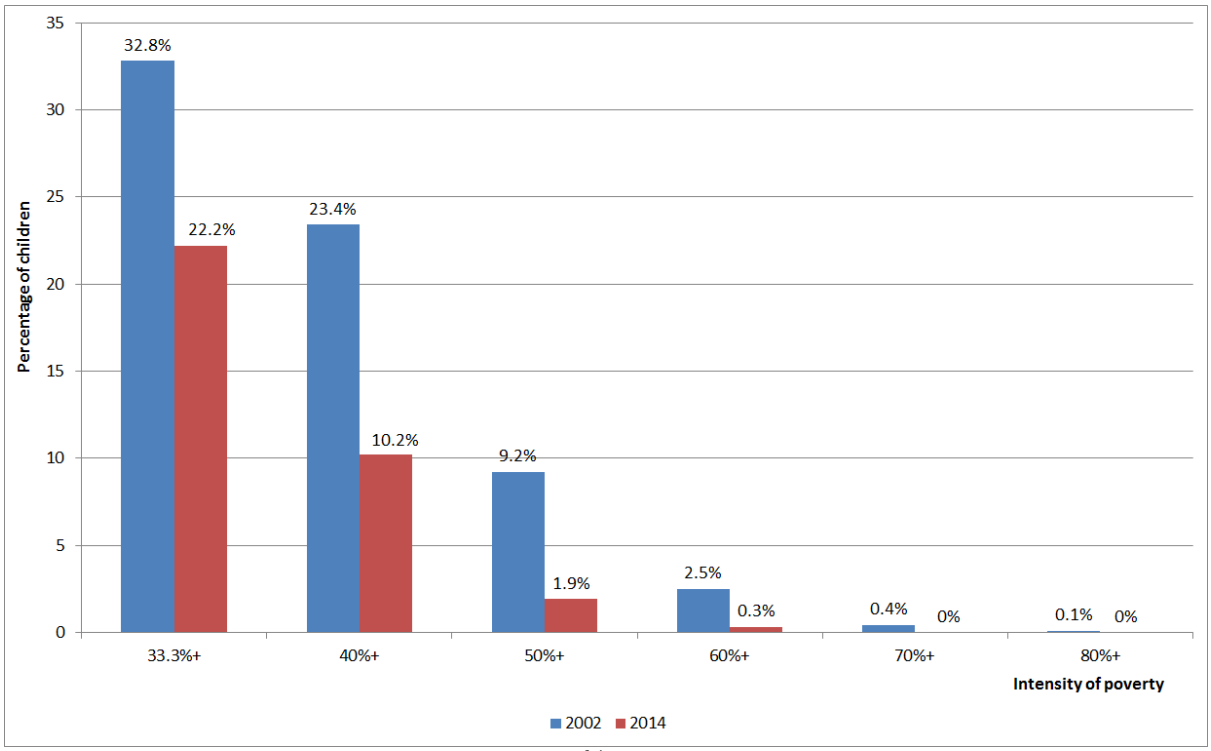

Figure 2: Percentage of children deprived in $x\%$ or more of the MPI weighted indicators in 2002 and 2014

When compared across the different categories and the time periods, we observe a downward trend in the percentage of children who experience deprivations. In 2002, 32.8% of children were deprived in one-third or more (33.33%+) of the weighted indicators while 23.7% were deprived

in at least 40% of the weighted indicators. While 23.7% of children were deprived in 40% or more weighted indicators in 2002, only 17.3% were deprived in 2014. Less than 10% and 2% of children were in severe poverty in 2002 and 2014 respectively. This implies that the proportion of children in severe poverty also decreased over time.

5.2 Composition of the Child MPI

In order to achieve the second objective of this paper, the Child MPI is broken down into the contributions of each weighted dimension and indicator to the overall Child MPI (see Figures 3, 4 and 5). Figure 3 shows the composition of the Child MPI by dimension for 2002 and 2014. Each bar represents the percentage contribution of each dimension to the overall Child MPI.

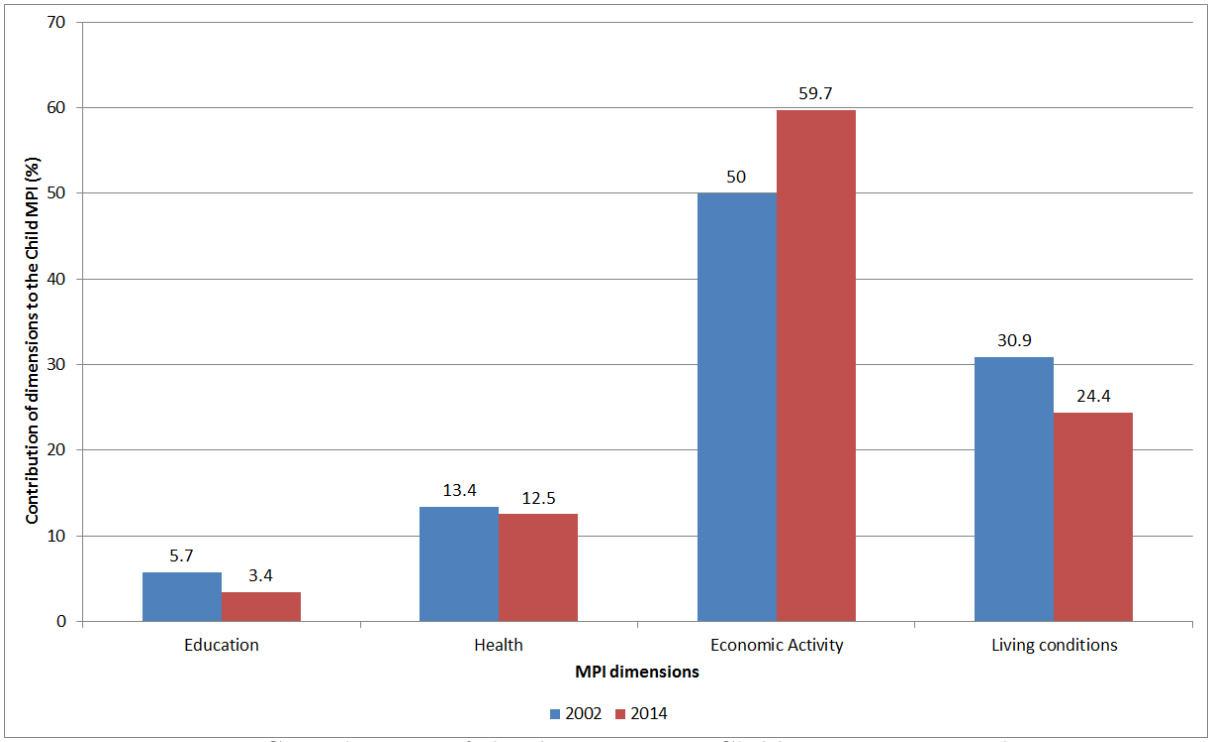

Figure 3: Contributions of the dimensions to Child MPI in 2002 and 2014

The result indicates that, in both time periods, the economic activity dimension has the largest contribution to the overall Child MPI, followed by living conditions, health and education. Although we observe a reduction in the percentage contributions for living conditions, education and health, the contribution of economic activity increase from 50% in 2002 to about 60% in 2014. Meanwhile, the percentage contributions of education, health and living conditions are 5.7%, 13.6% and 30.9%, respectively, in 2002, while they were 3.3%, 11.5% and 28.6%, respectively, in 2014.

Figures 4 and 5 show the composition of the Child MPI in each indicator for 2002 and

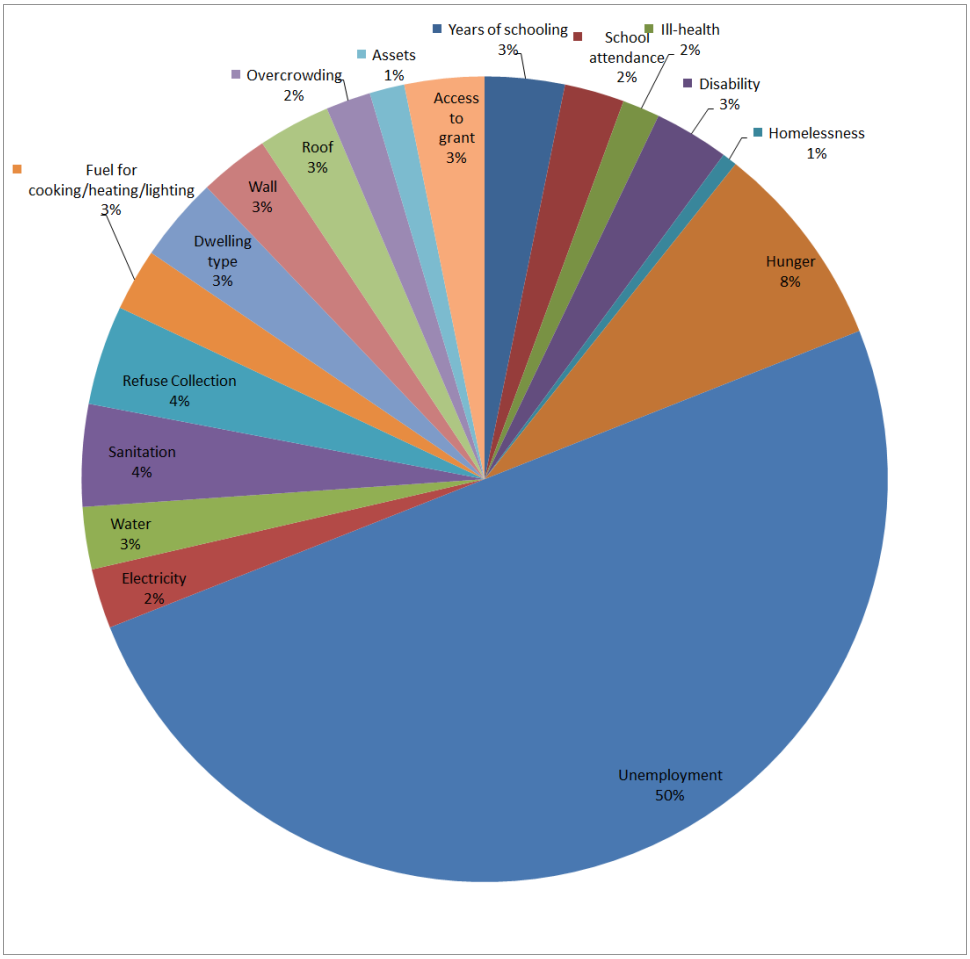

Figure 4: Contributions of the indicators to Child MPI in 2002

2014, i.e. the percentage of the MPI-poor children who are deprived in each indicator in both time periods; it does not include deprivations for the non-poor children. Each piece of the pie represents the percentage contribution of each indicator to the overall Child MPI. The larger the contribution, the bigger is the weighted share of the indicator to the overall Child MPI. We find that, in both time periods, household unemployment contributes the largest to the overall Child MPI, and its weighted shares increase over time. This result also mirrors that of Figure 3, where the economic activity dimension is the largest contributor to the Child MPI in both time periods, and its contribution also increase over time. Moreover, when the different indicators are compared between the two time periods, there is an increase in the percentage contribution of disability to the overall Child MPI, while the contributions by hunger, homelessness, school attendance, overcrowding, water and electricity reduced. Meanwhile, the contributions of years of schooling, access to child support grant, assets ownership, roof, wall, dwelling type, refuse collection, sanitation and ill-health remain unchanged. However, the noteworthy difference is that for the MPI-poor children, unemployment is the indicator with the highest percentage

contribution to the Child MPI; on the other hand when the entire child population is considered (see Figure 1), unemployment only features in the middle range of deprivations. This contrast suggests that deprivation in "household" unemployment is disproportionately experienced by children who face multiple deprivations in other indicators.

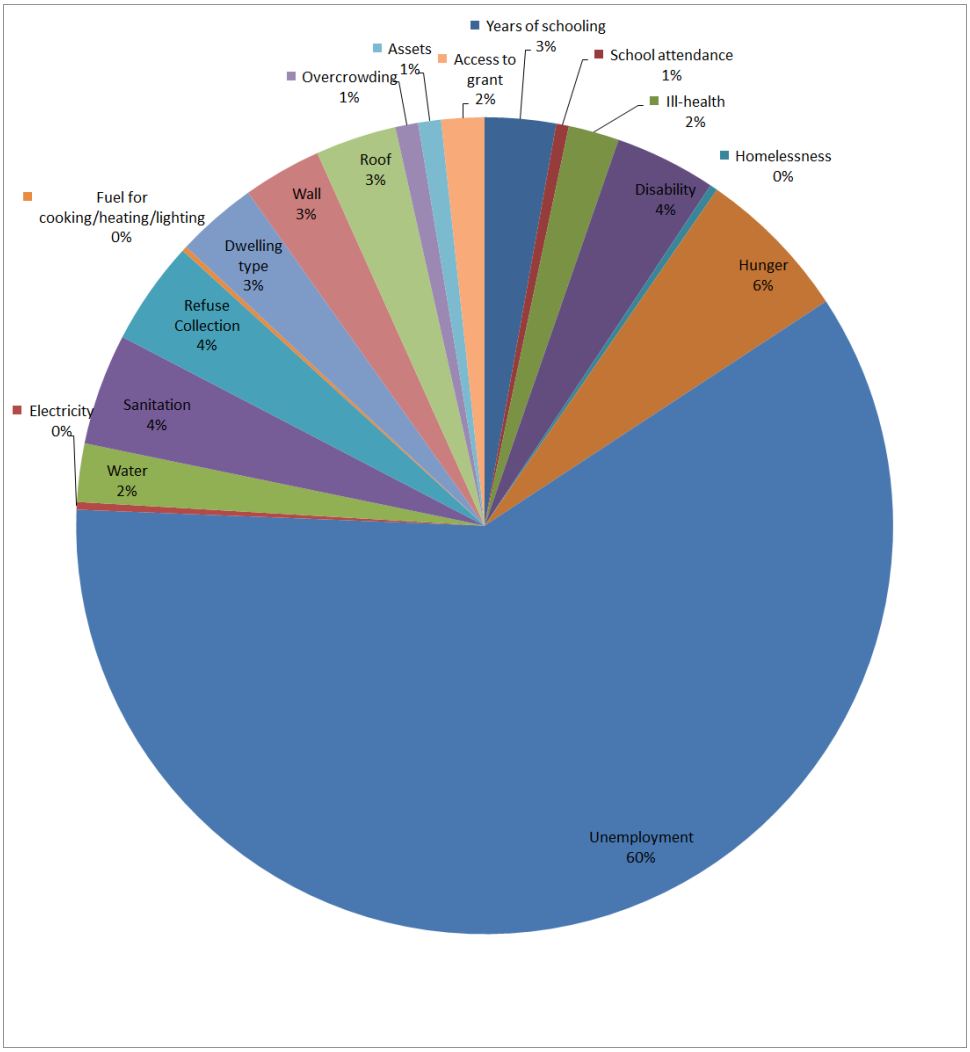

Figure 5: Contributions of the indicators to Child MPI in 2014

5.3 Decomposition of the Child MPI by socio-demographic factors

To accomplish the third objective of this paper, the Child MPI was decomposed across socio-demographic factors, which include: gender, race, metropolitan status and province. Their respective contributions in each year are subsequently reported. From Figure 6, the three socio-demographic factors with the largest contributions to overall Child MPI are race, metropolitan status and gender, with respective MPI contributions that are above 0.4 in both time periods. In particular, being an African Black or residing in rural area contributes significantly to the

Child MPI in both time periods. Female children, than their male counterparts, are more likely to be multi-dimensionally poor. Similarly, the Black African children suffer more deprivations than the other population groups. The result further suggests that children living in the urban areas are multi-dimensionally poorer than those living in rural areas. Notably, child poverty is concentrated in the former homeland areas, with the highest proportion of children who are MPI poor from Kwazulu-Natal, followed by Eastern Cape and Limpopo. We also find that there is a slight increase over time in the proportion of poor children who reside in Limpopo, NorthWest, Free State, Northern and Western Cape, as opposed to those who reside in Eastern Cape, Mpumalanga, Kwazulu-Natal and Gauteng.

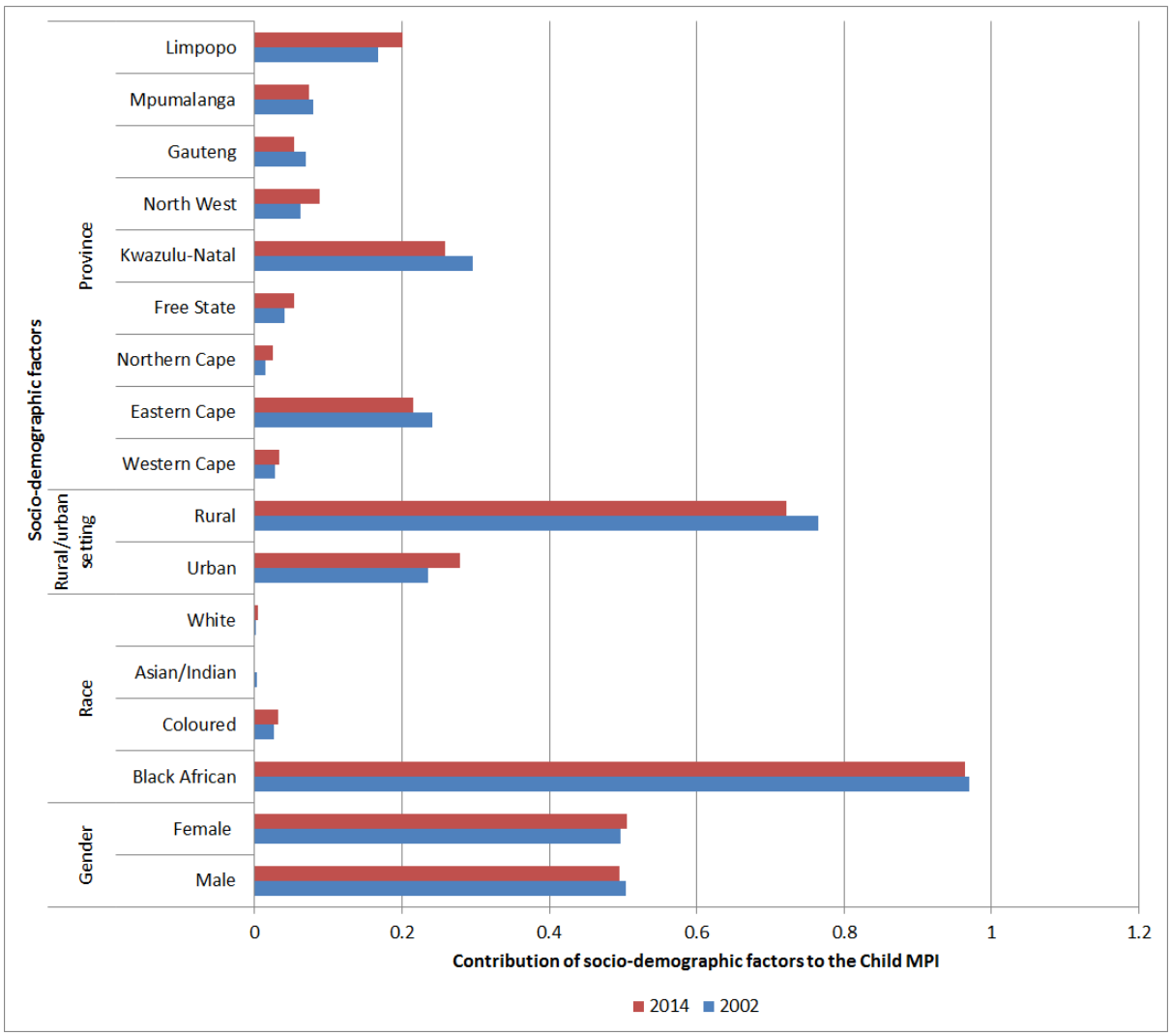

Figure 6: The contributions of a subset of socio-demographic factors to the overall Child MPI in 2002 and 2014

6 Conclusion

In South Africa, young children continue to face multiple forms of deprivation. A considerable proportion not only live in households that experience income poverty, but are also faced with low levesl of educational attainment, few employment opportunities, poor living standards and poor health outcomes. However, there is currently little understanding of the multiplicity of the deprivation and inequality faced by young children. There is little empirical analysis of child-specific data showing the extent to which deprivations vary across different dimensions and key socio-demographic factors. Improving our understanding of these multiple forms of deprivation and developing child-specific poverty measures is key to development policies targeted at young children. This research attempts to fill these gaps by developing a Child Multidimensional Poverty Index, following the Alkire-Foster method. The Child MPI was designed using the nationally representative General Household Surveys of 2002 and 2014 to quantify the change in the nature and extent of multidimensional poverty among young South African children. Its dimensions and indicators were selected to reflect experiences that are particularly unique to young children. Nationally representative and publicly available data from General Household Surveys of 2002 and 2014 were used to estimate the Child MPI measures. The results indicate that that there has been some reduction in the Child MPI over time. However, the incidence of deprivations relating to housing and living condition persist among the majority of the MPI-poor children; a considerable proportion (about 36%) of children live in households with poor living conditions. Moreover, there is an increase in the incidence of deprivation relating to health status of children. Further analysis suggests that economic activity contributes the largest child multidimensional poverty over time. Notably, the decomposition analysis shows that multidimensional child poverty are concentrated among females, Black Africans, rural dwellers, and in the former homeland areas over time. Although this analysis is descriptive in nature, the results demonstrate the potential usefulness of the Child MPI as a tool for reviewing policies and interventions directed at children.

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Appendix A Additional Tables

Table A.1: Correlations between different specifications of the Child MPI using alternative weighting structures, GHS 2002 data

	Weight 1	Weight 2	Weight 3	Weight 4	Weight 5
Weight 1	1	0.988	0.994	0.998	0.998
Weight 2	0.988	1	0.997	0.976	0.993
Weight 3	0.994	0.997	1	0.986	0.996
Weight 4	0.998	0.976	0.986	1	0.993
Weight 5	0.998	0.993	0.996	0.993	1
No. of provinces	6				

Table A.2: Pearson's rank correlation matrix for different Child MPI rankings using alternative poverty cut-offs, GHS 2002 data

Poverty cut-offs (%)	30%	40%	50%	60%	70%
30%	1	0.996	0.972	0.924	0.911
40%	0.996	1	0.989	0.954	0.935
50%	0.972	0.989	1	0.987	0.964
60%	0.924	0.954	0.987	1	0.965
70%	0.911	0.935	0.964	0.965	1
No. of provinces	9				

Table A.3: Correlations between different specifications of the Child MPI using alternative weighting structures, GHS 2014 data

	Weight 1	Weight 2	Weight 3	Weight 4	Weight 5
Weight 1	1	0.970	0.957	0.997	1.000
Weight 2	0.970	1	0.998	0.956	0.969
Weight 3	0.957	0.998	1	0.943	0.958
Weight 4	0.997	0.956	0.943	1	0.997
Weight 5	1.000	0.969	0.958	0.997	1
No. of provinces	6				

Table A.4: Pearson's rank correlation matrix for different Child MPI rankings using alternative poverty cut-offs, GHS 2014 data

Poverty cut-offs (%)	30%	40%	50%	60%	70%
30%	1	0.984	0.929	0.835	0.500
40%	0.984	1	0.966	0.890	0.593
50%	0.929	0.966	1	0.895	0.650
60%	0.835	0.890	0.895	1	0.786
70%	0.500	0.593	0.650	0.786	1
No. of provinces	9				