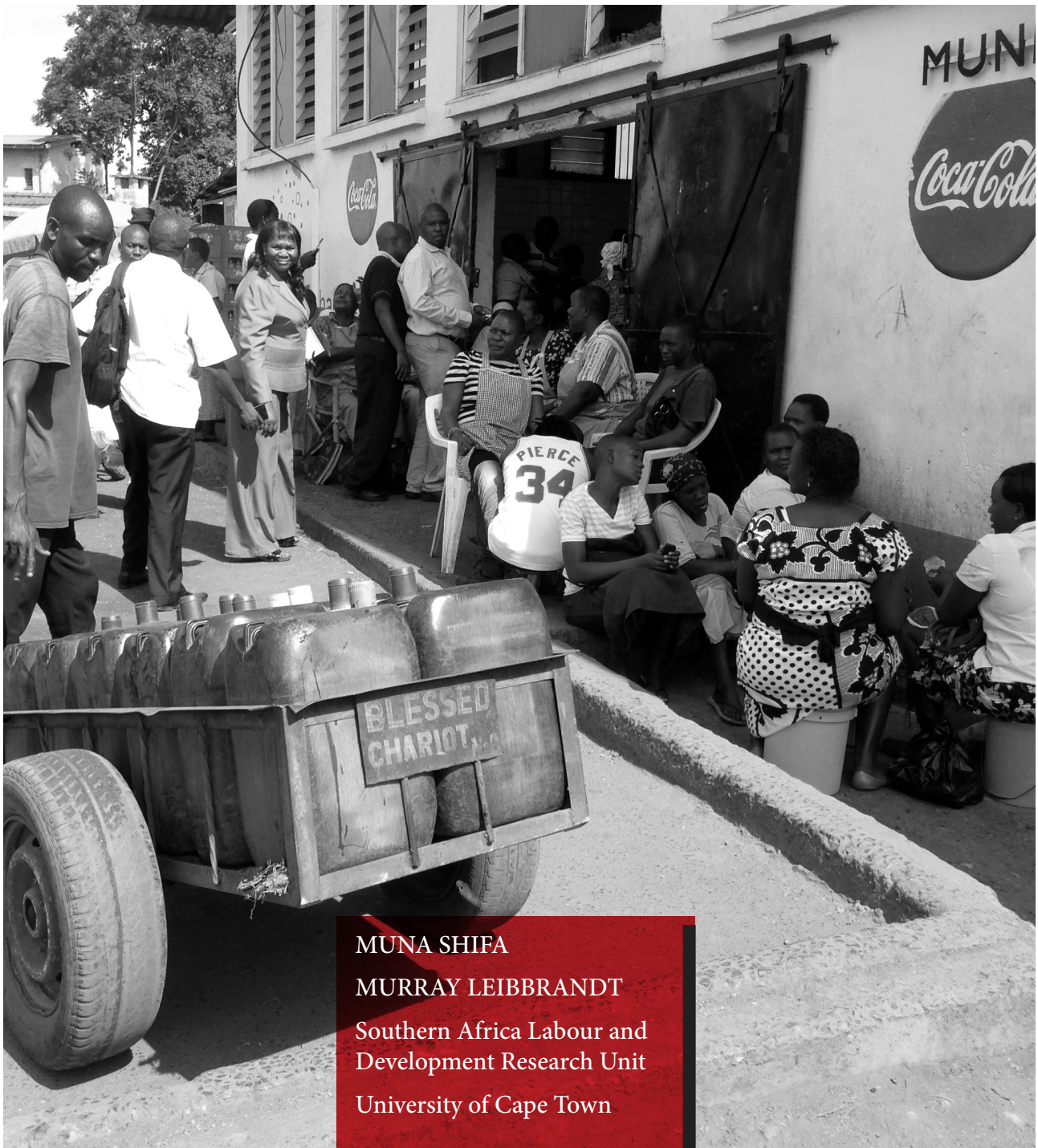


CONSUMING URBAN POVERTY WORKING PAPER

Profiling Multidimensional Poverty and Inequality in Kenya and Zambia at Sub-National Levels

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Consuming Urban Poverty Project

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The Consuming Urban Poverty project (formally named the Governing Food Systems for Alleviating Poverty in Secondary Cities in Africa) argues that important contributions to debates on urbanization in sub-Saharan Africa, the nature of urban poverty, and the relationship between governance, poverty and the spatial characteristics of cities and towns in the region can be made through a focus on urban food systems and the dynamics of urban food poverty. There is a knowledge gap regarding secondary cities, their characteristics and governance, and yet these are important sites of urbanization in Africa. This project therefore focuses on secondary cities in three countries: Kisumu, Kenya; Kitwe, Zambia; and Epworth, Zimbabwe. The support of the Economic and Social Research Council (UK) and the UK Department for International Development is gratefully acknowledged. The project is funded under the ESRC-DFID Joint Fund for Poverty Alleviation Research (Grant Number ES/L008610/1).

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Summary

Persistent spatial disparities in poverty remain prevalent in most developing and transition economies. However, spatial analyses of poverty in poor countries are generally limited to rural-urban or provincial breakdowns. Despite the fact that poverty is a multidimensional phenomenon, existing subnational-level poverty analyses mainly use money-metric indicators of individual welfare. In this study, we use census data to estimate multidimensional poverty at lower levels of geographic disaggregation in Zambia and Kenya. The study results show that, in general, the extent of multidimensional poverty is significantly higher in rural areas than in urban areas in both countries. However, the results also indicate that, although deprivation levels in access to basic services are relatively lower in large urban centres such as Nairobi and Mombasa in Kenya, and Lusaka, Livingstone and Ndola in Zambia, these are areas where deprivation levels have increased significantly over time. The findings suggest that the extent of provision of basic services in urban centres does not match the extent required to accommodate the rapid urban growth that has occurred over the last few decades in both countries. Furthermore, there are large differences in poverty within urban areas and even within cities. For instance, constituency-level estimates show that, within Nairobi the incidence of poverty varies from 20% in Westland constituency to 41% in Langata constituency. In Lusaka the incidence of poverty ranges widely, from 17% in Kabwata constituency to 53–55% in Chawama and Kanyama constituencies. These results highlight the importance of a sufficient level of geographic disaggregation in poverty analysis in order to identify disadvantaged areas within rural and urban regions of a country.

Keywords : multidimensional poverty, income poverty, urban growth, deprivation levels

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1. Introduction

Following the adoption of the United Nations Millennium Development Goals (MDGs), significant progress has been made in improving average living conditions in many developing countries. However, persistent spatial disparities in living standards have remained prevalent in most developing/transition economies (Deichmann, 1999; Daimon, 2001; Kanbur and Venables, 2005; Grant, 2010; Alkire, et al., 2014). Many studies in Africa have shown that there are large regional differences in human development between those living in urban areas and those living in rural or remote areas of a given country (Christiaensen, et al., 2005; Abdulai and Hulme, 2015). In addition, some studies have shown that spatial poverty traps exist not only in remote or rural areas, but also in urban areas of many developing countries (Hyman, et al., 2005; Grant, 2010).

With the exception of a few studies, spatial analysis of poverty in poor countries is limited to a rural-urban or provincial breakdown. This is because existing household survey sample sizes are often too small to be representative at a low level of geographic disaggregation. The few studies that do examine patterns of poverty and deprivation at a very low level of geographic disaggregation use income or consumption to measure poverty (Hyman, et al., 2005; De la Fuente, et al., 2015). However, there is consensus that poverty and well-being are multidimensional concepts. In addition, large within-country geographical differences in the incidence of poverty are often related to lack of access to assets that support livelihoods or opportunities, and lack of access to basic services such as health, education and infrastructure (Christiaensen, et al., 2005; Grant, 2010; Alkire, et al., 2014). The interconnectedness of various deprivations means that more emphasis should be given to tackling these institutional and social obstacles instead of focusing only on income poverty (Sen, 1992a; Alkire and Santos, 2010).

Inequalities in living standards due to differences in geographical regions are important to policymakers for two reasons (Kanbur and Venables, 2005). First, inequality due to regional disparities is a component of overall national inequality. Thus, a rise in spatial disparity can be associated with a rise in overall inequality. Second, large disparities in development in a country's regions can have an adverse effect on social and political stability, especially when regional disparities align with ethnic, racial, religious or political divisions (Stewart, 2000; Kanbur and Venables, 2005; Muhula, 2009). In turn, these factors have important implications for poverty reduction. Although economic growth is necessary for poverty reduction, the extent to which economic growth reduces poverty depends on how the growth pattern affects income distribution (Ferreira, et al., 2010). Likewise, violent conflict and political instability are among a number of factors that may contribute to persistent poverty in poor countries (Luckham, et al., 2001; Goodhand, 2003).

In this study the authors estimated multidimensional poverty at lower levels of geographic aggregations, such as districts and constituencies, using data from Zambia and Kenya. After experiencing significant economic decline in previous decades, both countries have achieved higher levels of economic growth since 2000. However, this has not translated into significant reductions in poverty. In Kenya, the proportion of people living below the national income poverty line increased from 46.1% in 2006 to 50.8% in 2008, and then reduced slightly to 49.8% in 2012 (KIPPRA, 2013). During the period 2006–2012 the number of people living below the income poverty line in Kenya increased by 3.3 million (KIPPRA, 2013). During the period 2003–2010,

the incidence of income poverty in Zambia only decreased from 66.5% to 60.5% (Chibuye, 2011).

In recent years both countries have adopted a constituency development fund (CDF) approach for a devaluation of resources to fund various community-based projects (see Kimenyi, 2005 (Kenya) and ZIPAR, 2015 (Zambia)). Thus, multidimensional poverty estimates at district and constituency levels can help policymakers to identify areas facing multiple deprivations for geographic targeting.

Population census datasets provide information on basic living standard indicators, including access to safe drinking water, sanitation, electricity, housing conditions and asset ownership. The Alkire and Santos (2010) counting approach was used to estimate a multidimensional poverty index (MPI). In calculating the MPI, poverty is characterised as inadequate access to basic services (e.g. education, health, water, sanitation) and an inadequate asset base to support livelihoods.

In Section 2, the data and methodology used to estimate multidimensional poverty estimates is discussed. Section 3 presents poverty estimates for both countries and a comparison of deprivation levels in access to basic goods and services over time. Section 4 provides a summary of the main findings.

2. Data and Methodology

2.1 Data sources

To construct the multidimensional poverty measures, data was used from the 2009 Kenya population census (10% sample) and the 2010 Zambia population census (10% sample). Both censuses provide information on various welfare indicators, including level of education, household asset holdings and access to basic services such as water, sanitation and electricity. In the case of Kenya, after dropping households and individuals with missing information in at least one indicator, the sample size comprised 867 201 households and 3 634 070 individuals. The corresponding sample size for Zambia was 250 384 households and 1 233 437 individuals.

Data from the 1999 Kenya population census (5% sample) and the 2000 Zambia population census (10% sample) was used to compare access to basic services at district/county levels over time. Although these censuses collected information on living standard indicators, most of the variables have not been coded consistently over the years. An analysis of progress in multidimensional poverty is therefore problematic. For this reason, this study used only some of the living standard indicators (access to electricity, water, sanitation and education) to compare changes over time.

In addition, income poverty estimates at district (Zambia) and county (Kenya) levels from recent small-area poverty mapping exercises in both countries were used. In the case of Kenya, small-area income poverty estimates were calculated by combining the 2009 Kenya census data with the 2005 Kenya Integrated Household Budget Survey (KIHBS). In the case of Zambia, small-area poverty mapping was based on data from the 2010 Living Conditions Monitoring Survey (LCMS), the 2010 Census of Population and Housing, and some auxiliary data (mainly from administrative records) that can be linked to survey and census (De la Fuente, et al., 2015).¹ Multidimensional poverty estimates

¹ The authors thank IPUMS-International for access to all census datasets, and the Kenya National Bureau of Statistics (KNBS) for disaggregated income poverty estimates.

at district (Zambia) and county (Kenya) levels were compared with those obtained using traditional small-area income poverty estimates in both countries.

2.2 Methodology

The conceptual framework used for calculating the MPI is Sen's Capability Approach (Sen, 1992b), in which poverty is defined as the failure of some basic capabilities to function, rather than the lowness of income. The key objection to using only income as a welfare indicator is that the capability of individuals or groups to convert income or other resources into valuable functionings depends on several other factors, including personal characteristics (e.g. physical and mental conditions), social norms (e.g. the role of women) and environmental factors (e.g. availability of public goods) (Sen, 1992b). The relevant functionings people value may vary from elementary functionings such as being well nourished, being adequately clothed and sheltered, and avoiding preventable morbidity, to more complex functionings such as being able to appear in public without shame (Sen, 1992b).

Although poverty is conceptualised as a failure of basic capabilities, due to the difficulty of measuring capabilities one can focus on some elementary functionings to measure acute poverty (Sen, 1992b). There are, however, various approaches in the literature to determining which dimensions to consider, how each dimension is measured, and how they are aggregated (see Alkire and Santos, 2010 for a review). In this study, Alkire and Santos's (2011) approach is used to estimate the MPI. Four dimensions are considered – education, health, assets, and living standard indicators – all of which are stipulated in the national development goals of both countries as measures of progress in human development. For aggregation purposes, the four dimensions are equally weighted. Each indicator within each dimension is also equally weighted. Table 1 presents a list of indicators, deprivation cut-offs and weightings used in the poverty analysis undertaken by this study. The deprivation cut-offs for most of the indicators considered here are in line with MDG guidelines (see Alkire and Santos, 2010).

Table 1: Dimensions, indicators, deprivation thresholds and weights of the MPI.

Indicator	Deprived if ...	Weight
Education		1/4
Years of schooling	Children aged <16 who are not at the anticipated age-adjusted year of schooling, and children aged >16 who have not completed at least eight years of schooling.	1/4
Health		1/4
Disability or morbidity	Has any morbidity.	1/4
Living standards		1/4
Electricity	If no access to electricity.	1/20
Sanitation	Sanitation facility is pit latrine uncovered, bucket latrine, bush, cess pool, or other.	1/20
Drinking water	Drinking water source is not any of the following: borehole, piped, protected well, protected spring.	1/20
Flooring	Floor is earth (dirt, sand or dung floor).	1/20
Cooking fuel	Cooking fuel is dung, wood or charcoal.	1/20
Assets		1/4
Asset ownership*	Not having at least one asset related to access to information (radio, TV, telephone) and not having at least one asset related to mobility (bicycle, motorbike, car, truck, animal cart, motorboat) or at least one asset related to livelihoods (refrigerator or livestock).	1/4

Note: *Similar indicators were used for both countries, except for asset holdings. The updated version of the United Nations Development Programme's MPI specification (see Kovacevic and Calderón, 2014) was followed in determining deprivations in asset holdings. Individuals are not deprived in livestock if they live in a household that has a horse, or a cow or a bull, or two goats, or two sheep, or 10 chickens. Information on livestock numbers is available for Kenya but not for Zambia, where information is only available about whether or not they raise livestock. Thus, the asset deprivation cut-off differs slightly for the two countries.

The MPI identifies multiple deprivations at the individual level. Deprivation scores in each indicator were calculated for each individual. An individual is considered deprived if the individual achievement in that indicator is below the deprivation cut-off for that indicator. Deprivation scores for each indicator were summed using their weights to identify multidimensionally poor individuals. A poverty cut-off (k) = 33.3% (1/3 of the weighted indicators) was used to identify poor and non-poor individuals. The incidence of poverty is measured as the multidimensional headcount ratio (H):

$$H = q/n$$

where q represents the number of people who are multidimensionally poor and n represents the total population.

The intensity of poverty (A), which reflects the average proportion of deprivations poor people experience, can be expressed as:

$$A = \frac{\sum C_i(k)}{q}$$

where $C_i(k)$ represents the deprivation score of the poor (the censored deprivation score of individual i), q represents the number of people who are multidimensionally poor, and k represents poverty cut-off. The MPI value is the product of the multidimensional poverty headcount ratio (H) and the intensity of poverty (A):

$$MPI = H \times A$$

The MPI can be decomposed by geographical region (province, rural, urban, etc.). The contribution of a given sub-population group j (with population share of $\frac{n_j}{n}$) to MPI is expressed as:

$$\frac{(n_j/n) \times MPI_j}{MPI}$$

Following Seth and Alkire's (2014) approach, the following formula can be used to estimate inequality in deprivation levels:

$$I(C) = \frac{4}{n} \sum_{i=1}^n [c_i - \mu(c_i)]^2$$

where C_i indicates weighted deprivation levels for each individual and $\mu(C_i)$ indicates average deprivation scores for each spatial unit (i.e. province, county or district).

3. Results

In this section, the results of MPI estimates are presented for Kenya (2009) and Zambia (2010) at various levels of geographic disaggregation. In addition, multidimensional poverty and inequality estimates at district (Zambia) and county (Kenya) levels are compared with those obtained using traditional small-area income poverty estimates. Also presented here is a comparison of welfare across two census periods using some of the living standard indicators that are comparable across time.

3.1 Multidimensional poverty in Kenya

Table 2 provides multidimensional poverty estimates for Kenya by provincial, rural and urban regions. The MPI for Kenya is 0.287, with the figure being relatively higher in rural and peri-urban areas compared to core urban areas. Similarly, the headcount ratio shows that the incidence of multidimensional poverty is 54.6% in Kenya, with the figure being relatively higher in rural areas (60.5%) and peri-urban areas (52.2%) compared to core urban areas (38%). The average intensity among the poor is 52.5%, suggesting that the average poor in Kenya are deprived in 52.5% of the weighted indicators. Decomposing the MPI by rural and urban areas shows that, while core urban areas constitute 23.3% of the population share, the contribution of core urban areas to total MPI is only 14.5%. In contrast, the contribution of rural areas to the total MPI is 78.5%, which is greater than the share of the rural population to the total population (69.1%). These figures indicate that rural areas bear a disproportionate share of poverty.

Looking beyond the rural and urban averages, Table 2 and Figure 1 show the existence of large within-country differences in the extent of multidimensional poverty in Kenya. Provincial-level estimates indicate that the MPI is highest in North Eastern province (0.47) followed by Coast and Rift Valley provinces (0.33 and 0.32 respectively), and lowest in Nairobi province (0.126) and Central province (0.198). Rift Valley and Coast provinces also have relatively higher deprivation inequality measures, with a variance of weighted deprivations of 0.19, while the figure is lowest in Nairobi at 0.13. Headcount poverty estimates indicate that the percentage of people who are multidimensionally poor is 81.5% in North Eastern province, while in Central and Nairobi provinces the percentages are 41.2% and 27.4% respectively. Decomposition of the MPI by provinces shows that Rift Valley province contributes the highest to the total MPI (28.7%), followed by Nyanza (14.3%) and Eastern (14.8%) provinces. The contribution of the poorest province, North Eastern, is 10%, which is greater than its population share (6.1%).

Table 2: Multidimensional poverty estimates for Kenya, 2009.
(Poverty cut-off =33.3%)

Indicator	MPI	Incidence of poverty (H%)	Average intensity (A%)	Contribution to MPI (%)	Population share (%)	Inequality in deprivation (variance)
Kenya	0.287	54.6	52.5			0.18
Provinces						
Nairobi	0.126	27.4	46.0	3.5	8.0	0.13
Central	0.198	41.2	48.1	7.8	11.3	0.14
Coast	0.329	61.8	53.2	9.7	8.4	0.19
Eastern	0.287	55.2	52.1	14.8	14.8	0.17
North Eastern	0.470	81.5	57.7	10.0	6.1	0.15
Nyanza	0.289	55.5	52.1	14.3	14.1	0.17
Rift Valley	0.319	58.5	54.5	28.7	25.9	0.19
Western	0.284	56.5	50.2	11.2	11.4	0.16
Rural	0.326	60.5	53.9	78.5	69.1	0.18
Core urban	0.179	38.0	47.0	14.5	23.3	0.15
Peri-urban	0.264	52.2	50.6	7.0	7.6	0.16
Gender						
Male	0.280	53.6	52.2			
Female	0.294	55.6	52.9			

Source: Author estimates using data from Kenya's 2009 population census.

The patterns of regional disparities are reflected in Table 1A in Appendix A, which provides income and multidimensional poverty and inequality estimates by county. Figure 1 maps values of income² and multidimensional headcount ratios across counties. Blue shaded areas represent counties with lower poverty levels, while red shaded areas represent higher poverty levels. The darker the shading the more pronounced the poverty (high and low). The incidence of multidimensional poverty is relatively low in five counties (Nairobi, 27%; Kiambu, 34%; Nyeri, 41%; Nyandarua, 41%; Mombasa, 44%), and higher than 70% in ten other counties, with the figure reaching 93% in Turkana, and 86% in Mandera and Samburu counties. Among the ten poorest counties, income poverty is greater than 70% for seven of these counties, with the percentage ranging from 59% to 66% for the other three.

² County-level income poverty and Gini coefficient estimates were obtained from the Kenya National Bureau of Statistics. Income poverty line estimates are KSh1 562 for rural areas and KSh2 913 for urban areas (per person per month). Shape files were obtained from New York University website: <https://geo.nyu.edu/catalog/stanford-yc436vm9005>.

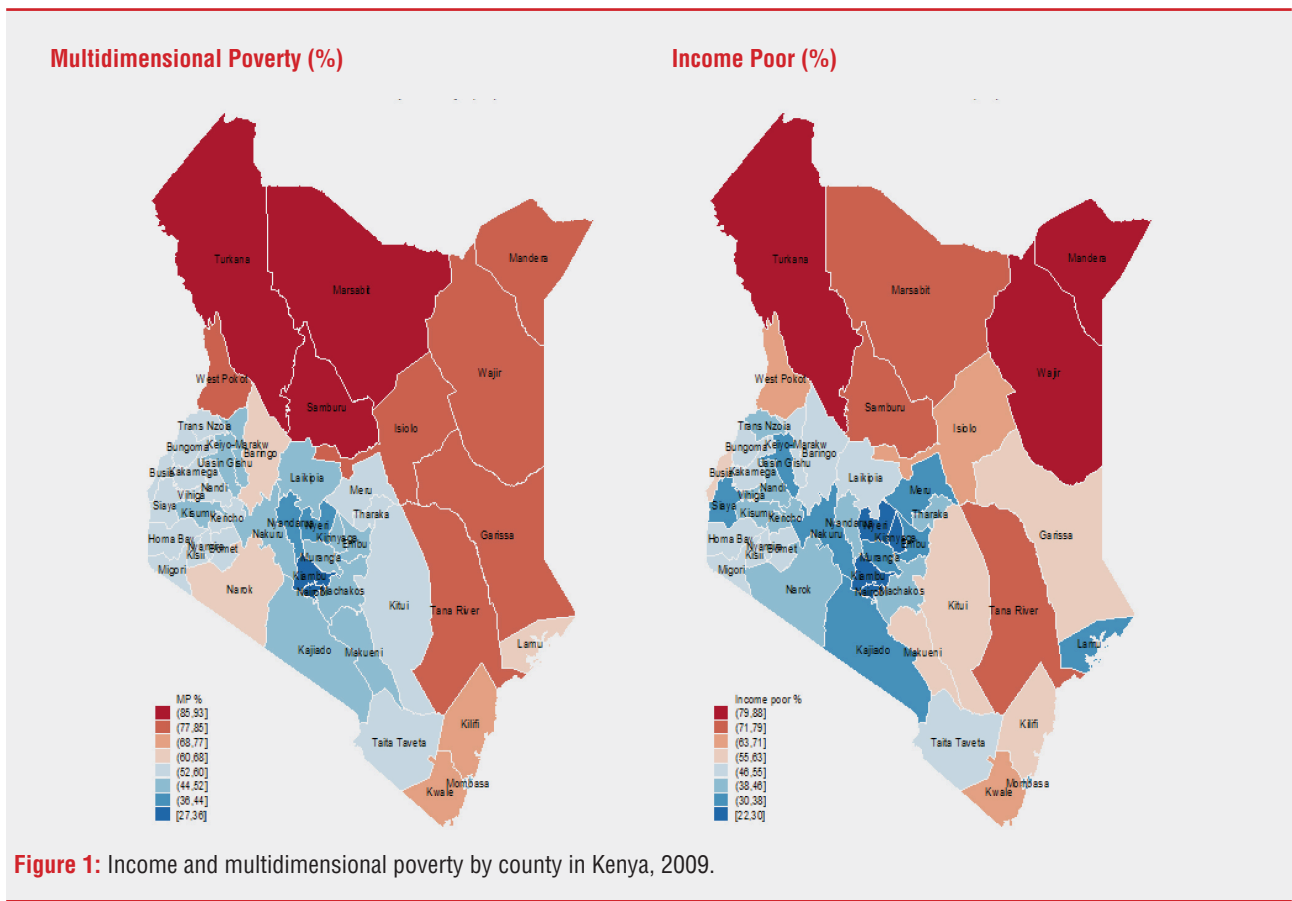
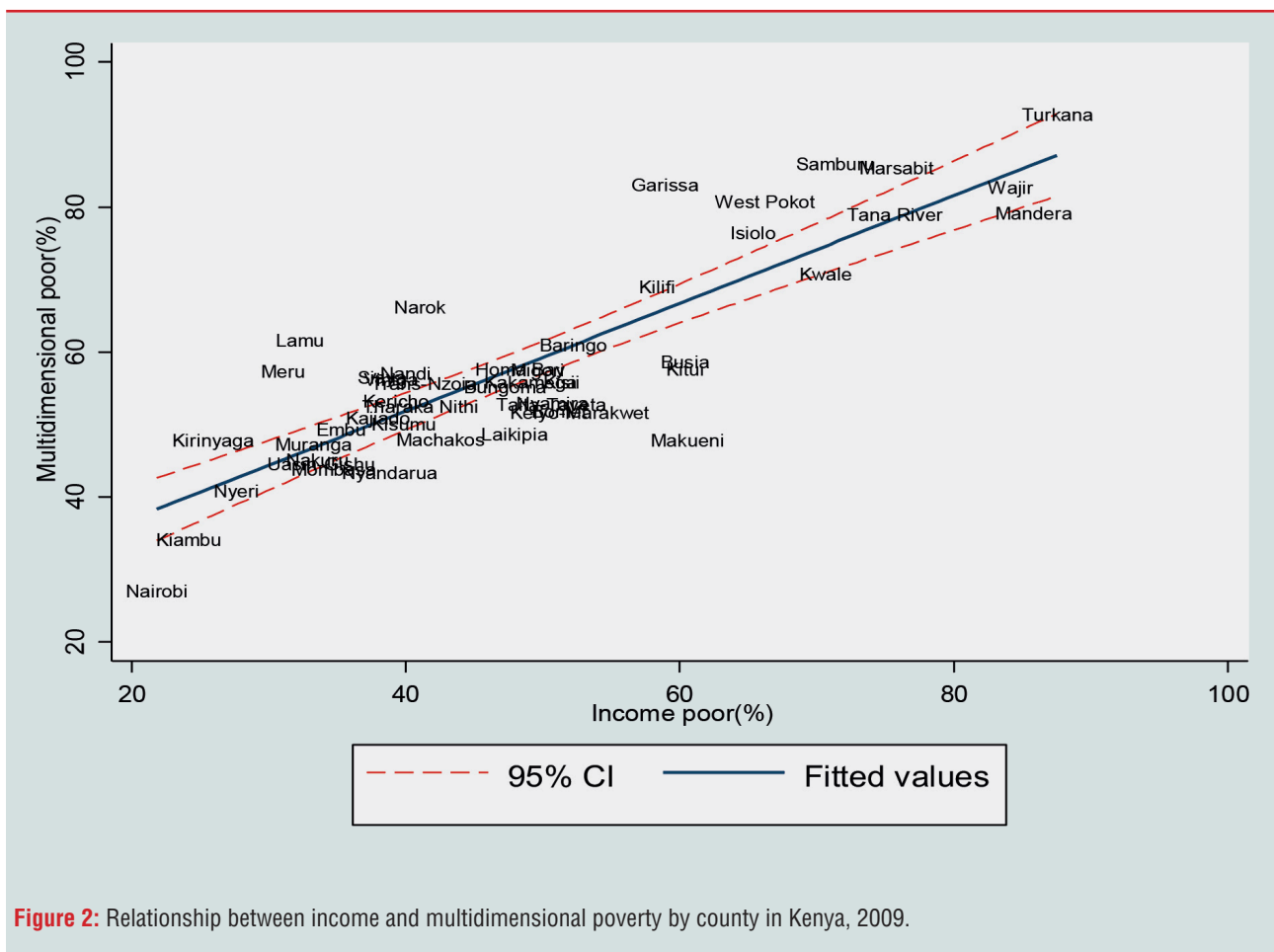


Figure 1: Income and multidimensional poverty by county in Kenya, 2009.

Source: Authors' multidimensional poverty estimations and income poverty estimates obtained from KNBS

Figure 1 shows an important geographical divide between counties within a given province. For instance, within Rift Valley province the level of poverty is lowest in Narok county (41% income poor and 66.5% multidimensional poverty) followed by Baringo county (52% income poor and 61% multidimensional poverty), while the figures are higher in Turkana (87% income poor and 93.1% multidimensional poverty) and Samburu counties (71.4% income poor and 86.2% multidimensional poverty). Figure 1 also shows significant correspondence between the income and non-income dimensions of poverty.

Figure 2 presents a scatter plot of income and multidimensional poverty headcounts by county. It is clear that there is a strong positive relationship between the extent of income poverty and multidimensional poverty estimates. The Spearman's rank correlation coefficient between the two poverty measures is 0.75 ($p < 0.000$). The results suggest that counties with high levels of multidimensional poverty also have a higher incidence of income poverty and vice versa.



Source: Authors' multidimensional poverty estimations and income poverty estimates obtained from KNBS

There are also geographical divides when one looks at inequality measures such as Gini for income and variance for multiple deprivation levels (see Table 1A in Appendix A). Income Gini estimates suggest that income inequality is relatively higher (>0.55) in Kwale, Kilifi and Tana River counties, which are all located in Coast province. In contrast, income inequality is lowest in Turkana (0.28), followed by West Pokot and Wajir counties, which are among the poorest counties, while the figure is 0.34 in the richest counties such as Nairobi and Kiambu. A relatively higher level of inequality in non-income deprivation indicators is observed in Baringo, Kajiado and Isiolo counties. Unlike the income and multidimensional poverty estimates, the rank correlation coefficient for the income Gini and the variance measures is only 0.47 ($p < 0.0008$) suggesting a low correspondence between the income Gini and the variance of deprivations measures.

In general, county-level poverty estimates suggest that both income and multidimensional poverty levels are relatively lower in counties that are predominantly urban, such as Nairobi, Kiambu, Nyeri and Mombasa. However, constituency-level poverty estimates show higher inequality in poverty levels within both urban and rural counties (see Table 2A in Appendix A). For instance, although the incidence of multidimensional poverty is only 27% in Nairobi county, the figure varies within the county from 20.7% in Westland constituency to 33.2% in Kamukunji and 41.2% in Langata constituencies. Likewise, within Mombasa county the incidence of multidimensional poverty is 25.6% in Mvita constituency, whereas the figure is greater than 40% in the other three constituencies. Using the 2009 Kenya population census data, Shifa and Leibbrandt (2017) found that, although multidimensional poverty estimates are relatively lower in large cities such as Nairobi, Ruiru and Mombasa, the incidence of

poverty in the two poorest locations in Nairobi (with poverty levels of 61% and 74%) is at least 15 times higher than in the richest two locations (with poverty estimates of <5%). Similarly, the incidence of multidimensional poverty in the poorest location in Mombasa is about eight times higher than that of the richest location. These findings suggest that comparing living standards across different regions based on average figures masks large between- and within-regional inequalities.

3.2 Multidimensional poverty in Zambia

Table 3 presents MPI estimates for Zambia by province.³ The MPI and the incidence of poverty for Zambia are 0.326 and 59.3% respectively. The average intensity among the poor is 54.9%, suggesting that the average poor in Zambia are deprived in 54.9% of the weighted indicators. Multidimensional poverty estimates for females are higher than that for males and the national average. Table 3 also shows large differences in the prevalence of poverty across provinces. The percentage of individuals who are multidimensionally poor is the lowest in Lusaka province (44.8%), while it ranges between 68% and 77% in six other provinces. Decomposing the MPI by province, one finds that Eastern province is the largest contributor at approximately 14% of the overall MPI. Southern province has a contribution of 11.6%. The contributions of Lusaka and Copperbelt provinces are 11.5% and 10.5% respectively, which are lower than their population shares. Although poverty is relatively lower in Lusaka and Copperbelt provinces, inequality measured using the variance of weighted deprivations is the highest in Copperbelt province (0.22), followed by Lusaka province (0.20).

³ The authors could not estimate poverty for urban and rural areas because there is no variable in the data to identify rural and urban areas.

Table 3: Multidimensional poverty estimates for Zambia, 2010.
(Poverty cut-off =33.3%)

Indicator	MPI	Incidence of poverty (H%)	Average intensity (A%)	Contribution to MPI (%)	Population share (%)	Inequality in deprivation (variance)
Zambia	0.326	59.3	54.9			0.22
Provinces						
Central	0.309	57.3	53.9	9.4	9.9	0.18
Copperbelt	0.222	43.6	51.0	10.4	15.3	0.22
Eastern	0.377	68.4	55.1	14.1	12.2	0.17
Luapula	0.414	71.4	58.0	9.6	7.5	0.18
Lusaka	0.220	44.8	49.2	11.5	16.9	0.20
Muchinga	0.397	69.3	57.3	6.6	5.4	0.17
Northern	0.419	72.0	58.3	10.8	8.4	0.18
North-Western	0.389	68.1	57.1	6.5	5.5	0.19
Southern	0.311	57.7	53.9	11.6	12.1	0.19
Western	0.460	77.1	59.6	9.4	6.7	0.18
Gender						
Male	0.311	57.5	54.0			
Female	0.340	61.1	55.6			

Source: Authors' calculations based on 2010 Zambia population census.

Further disaggregation at district and constituency levels shows large disparities in poverty levels within provinces and across different districts (see Tables 1B and 2B in Appendix B). Figure 3 maps the incidence of income poverty and multidimensional poverty estimates by district.⁴ The incidence of multidimensional poverty ranges from 31% to 39% in five relatively less poor districts (Livingstone, Luanshya, Chingola, Mufulira and Chililabombwe), while the figure ranges from 80% to 87% in the five poorest districts (Shang'ombo, Kalabo, Lukulu, Mpulungu and Senanga). Four of the five richest districts are located in Copperbelt province (Livingstone is located in Southern province), while four of the five poorest districts are located in Western province.⁵

⁴ District-level income poverty estimates are obtained from a small-area poverty mapping exercise (De la Fuente et al., 2015). The poverty line for the income poverty estimates is ZK146 009. Shape files were obtained from New York University website: <https://geo.nyu.edu/catalog/stanford-yc436vm9005>.

⁵ Using a first-order dominance approach, a study by Masumbu and Mahrt (2014) found similar welfare rankings for districts in Zambia.

Multidimensional Poverty (%)

Income Poor (%)

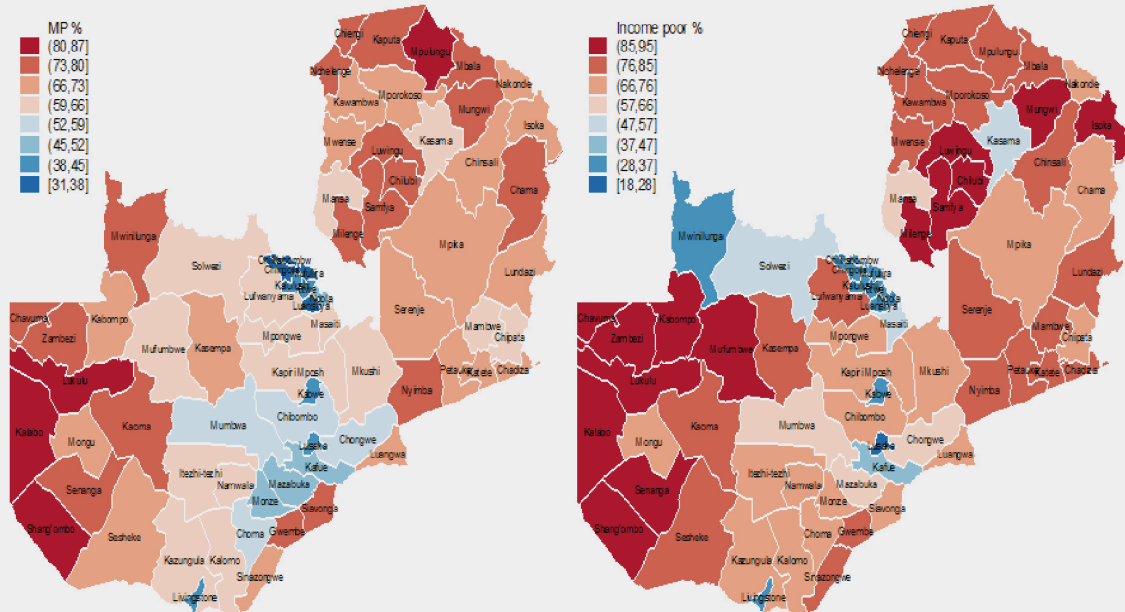


Figure 3: Income and multidimensional poverty by district in Zambia, 2010.

Source: Authors' multidimensional poverty estimations and income poverty estimates obtained from De la Fuente, et al. (2015)

The incidence of multidimensional poverty in the two largest urban districts, Kitwe and Lusaka, is 42% and 43% respectively. Lusaka is the least poor district when it comes to income poverty, with only 18% of the population considered income poor. The figure ranges between 28% and 33% in the other nine relatively less income poor districts (Kabwe, Luanshya, Chingola, Ndola, Kalulushi, Mufulira, Chililabombwe, Kitwe and Livingstone), which are also largely urban. In contrast, the incidence of income poverty is greater than 60% in 57 of the 72 districts, with the figure ranging from 88% to 95% in five of the income-poor districts (Milenge, Kalabo, Kabompo, Samfya, and Shang'ombo). Looking at the relationship between the incidence of income poverty and multidimensional poverty estimates suggests that there is high correlation between measures of income and multidimensional poverty at district level (see Figure 4) with a Spearman's rank correlation coefficient of 0.8 ($p < 0.000$).

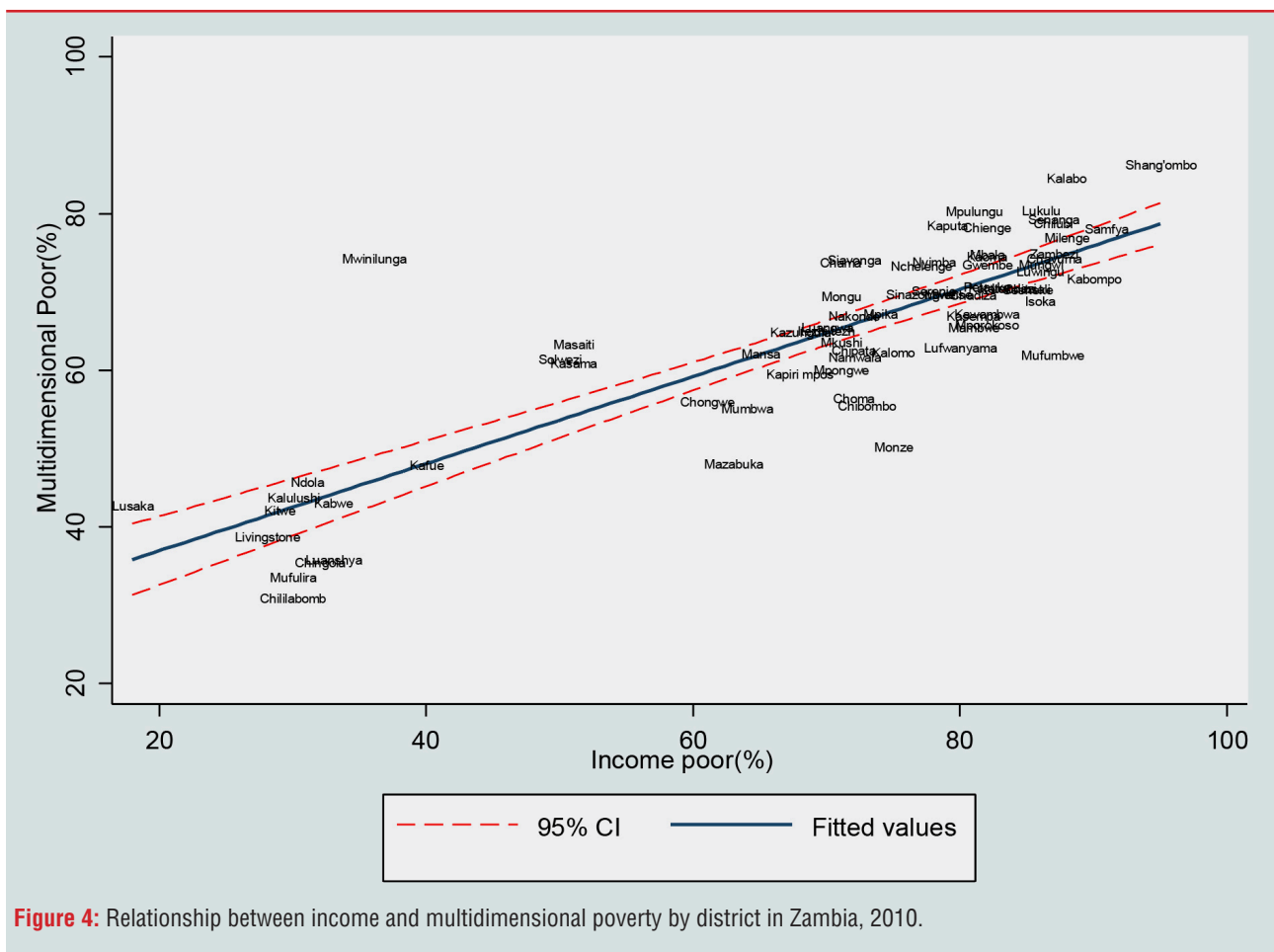


Figure 4: Relationship between income and multidimensional poverty by district in Zambia, 2010.

Source: Authors' multidimensional poverty estimations and income poverty estimates obtained from De la Fuente, et al. (2015)

Figure 4 also shows a high level of polarisation in the level of development between urban and rural districts in Zambia. Based on income and multidimensional poverty measures in general, urban districts are less poor than rural districts. Further disaggregation of poverty estimates into constituencies within each district reveals large disparities in poverty levels in both urban and rural districts (see Table 2B in Appendix B). For example, within Lusaka district, the percentage of people who are multidimensionally poor is 17% to 23% in Kabwata and Lusaka central constituencies, and between 53% and 55% in Chawama and Kanyama constituencies. Likewise, within Kitwe district, the incidence of poverty ranges from 28% in Wusakile constituency to 52% in Chimwemwe constituency. Although the constituency-level poverty estimates show that, on average, urban districts are less poor than rural districts in Zambia, there are also large differences in poverty rates within large urban districts.

3.3 Change over time in access to basic services

Given that not all of the variables used to calculate the MPI in this study are consistently measured across different census years, comparing multidimensional poverty estimates over time is problematic. For this reason, this section reviews some of the welfare indicators that are comparable across two census years in order to compare living standards over time. In the case of Zambia, the authors looked at changes in deprivation levels in access to electricity, safe drinking water, improved sanitation, and education for those aged 18 and over (considered deprived if they have not completed second-stage lower-primary education, which is nine years of schooling). Figure 5 shows the relationship

in deprivation levels for these indicators in 2000 and 2010 at district level. In addition, Figure 1B in Appendix B provides the percentage changes in deprivation levels for each indicator by district.

Significant persistence in the levels of deprivation is evident in all four indicators between 2000 and 2010. In particular, during both periods, large gaps exist in the level of deprivation in education, access to electricity and improved sanitation. Among the four indicators, improvements in the level of deprivation is observed mainly in education and access to safe drinking water. Figure 1B indicates that the proportion of individuals aged 18 and above with less than nine years of education has declined in all districts except Chiengi district, where it increased by 1.7%. However, the extent of decline in education deprivation is not uniform across districts. While the figure decreased by more than 20% in 11 districts that are mainly urban (Chingola, Chililabombwe, Luanshya, Mufulira, Lusaka, Solwezi, Livingstone, Kitwe, Kabwe, Kalulushi and Ndola), it decreased by less than 3% in ten other districts (Mbala, Gwembe, Namwala, Kaputa, Chilubi, Chinsali, Sinazongwe, Luwingu, Mungwi and Nchelenge).

Likewise, the proportion of individuals with no access to electricity decreased over time in 55 districts. Large declines were observed in Lusaka (26.4%), followed by Solwezi (10%) and Mazabuka (9%). In contrast, the figure increased in 15 other districts, with the highest increase observed in Kalulushi (18.3%), followed by Mufulira (11.5%) and Kabwe (8.1%), all of which are largely urban districts. In many districts there has been a significant reduction in the percentage of people who do not have access to safe drinking water and improved sanitation services.

However, the percentage of people who are deprived in access to safe drinking water and improved sanitation increased significantly in major urban districts of Zambia. For instance, the extent of deprivation of safe drinking water has increased by more than 20% in seven districts (Kafue, Kabwe, Mufulira, Chililabombwe, Lusaka, Livingstone and Ndola). The highest increase was observed in Ndola (308%), followed by Livingstone (212%) and Lusaka (189%).

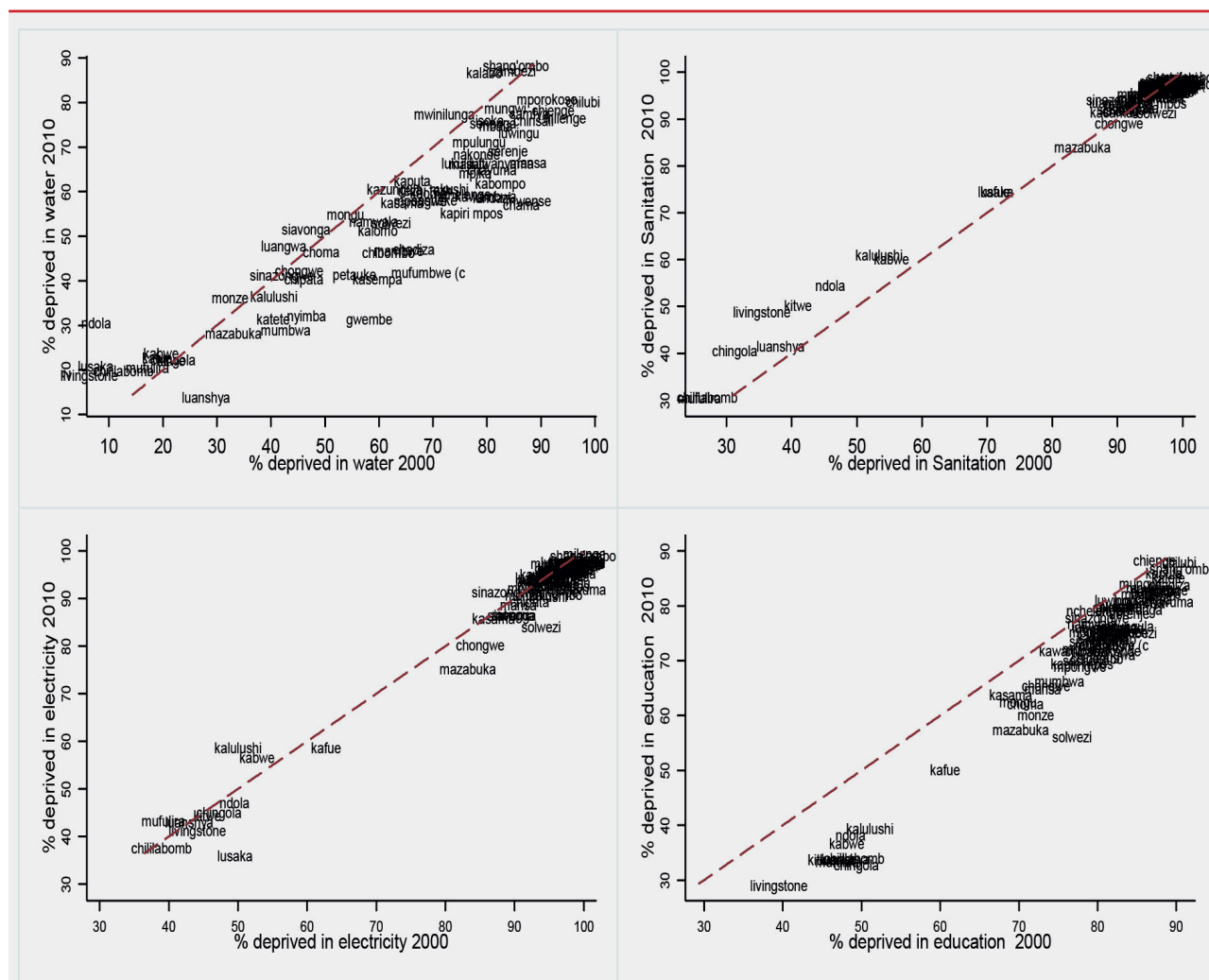


Figure 5: Deprivations in education and access to basic services by district in Zambia, 2000 and 2010.

Source: Authors' estimates using data from the 2000 and 2010 Zambia population censuses

Deprivation levels in access to improved sanitation services increased in 33 districts, with the figure increasing 10–40% in Luanshya, Chililabombwe, Kalulushi, Ndola, Mufulira, Kitwe, Chingola and Livingstone districts, 5.2% in Lusaka and 9.7% in Kabwe district. These results indicate that, although the level of deprivation in access to safe drinking water and sanitation services in many large urban districts is lower than that of rural districts, the change over time figure indicates that major urban districts are the areas where deprivation levels have increased significantly.

Figure 6 and Figure 1A (see Appendix A) provide estimates of changes in deprivation levels in education, access to piped water

and electricity for Kenya. Deprivation in education was calculated for those aged 18 and over (considered deprived if they have not completed second-stage lower-primary education, which is eight years of schooling). The use of piped water may not be appropriate in defining deprivation levels in rural areas, where access to safe drinking water includes water from protected wells, springs and boreholes. However, in the 1999 population census, information on whether water sources from wells and springs were protected was not collected. To capture changes in rural areas, the authors calculated a second variable indicating deprivation in water, considering water obtained from wells, springs and boreholes as safe, irrespective of protection, in 1999 and 2009.⁶

⁶ Thus, only access to water from a pond, dam, lake, river and jabia are considered unsafe. The authors could not compare deprivation levels in access to improved sanitation because the variable was not comparable across the two censuses.

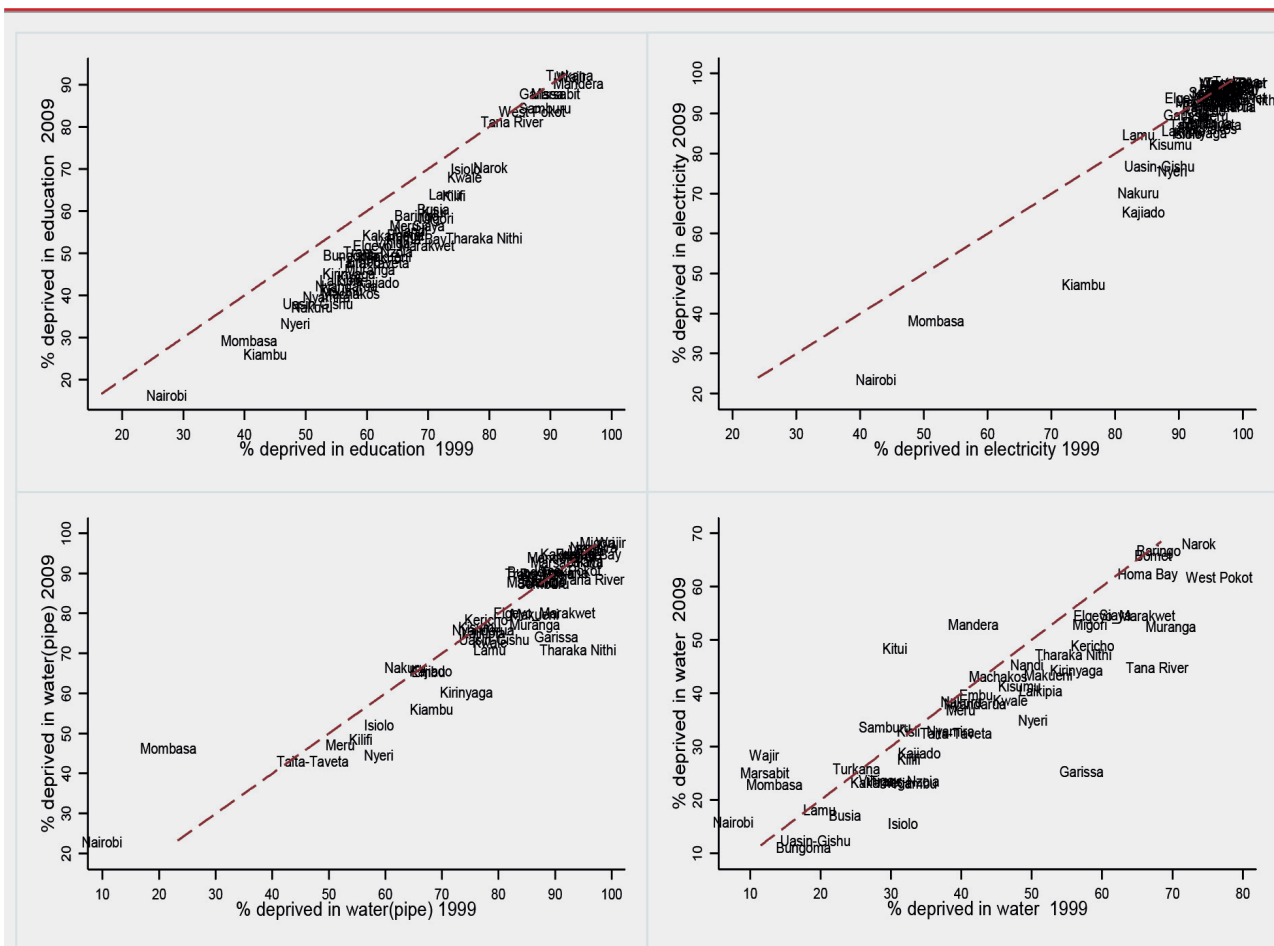


Figure 6: Deprivations in education and access to basic services by county in Kenya, 1999 and 2009.

Source: Authors' estimates using data from the 1999 and 2009 Kenya population censuses.

A comparison of the 1999 and 2009 scatter plots shows a clear, large persistence in the level of deprivation across counties in Kenya. Results from Figure 6 and Figure 1A (see Appendix A) show that deprivation in education decreased in all the counties, albeit with significantly varying degrees. While the figure decreased 25–39% in ten counties (Kiambu, Nairobi, Tharaka-Nithi, Nyeri, Kajiado, Machakos, Mombasa, Nakuru, Uasin Gishu and Kisumu), it decreased by less than 3% in Marsabit, Tana River, Wajir, Turkana and Garissa counties. Likewise, deprivation levels in access to electricity only increased in four counties: Samburu, Marsabit, Mandera and Lamu (increasing by less than 2%). Large declines in the level of deprivation in access to electricity were observed in Nairobi (43%), Kiambu (37%) and Mombasa (26%) counties.

In contrast to access to electricity and education, the level of deprivation in access to piped water increased in many counties. Deprivation in access to piped water increased in 20 counties, with the figure highest in Nairobi (138.7%), followed by Mombasa (116.2%), Mandera (5.5%) and Nakuru (5.3%). In contrast, deprivation levels in access to piped water decreased by at least 10% in nine counties (Tharaka-Nithi, Nyeri, Kirinyaga, Garissa, Kiambu, Kilifi, Isiolo and Murang'a). If water sources such as wells, springs and boreholes are considered safe (irrespective of whether they are protected or not), deprivation in access to water increased in only nine counties, with the figure highest in Wajir (140%), followed by Nairobi (114.4%), Marsabit (110.9%) and Mombasa (73.9%). Among the counties where deprivation

in access to water increased between 1999 and 2009, five of them (Wajir, Marsabit, Samburu, Mandera and Turkana) were also among the seven poorest counties in multidimensional poverty terms in 2009. The results indicate that, although the provision of access to safe drinking water is higher in large urban centres, a higher increase in deprivation levels has been observed in both Mombasa and Nairobi counties.

4. Conclusion

Using population census data, this study provides spatially disaggregated MPI estimates for Zambia and Kenya. The use of MPI as a welfare indicator enables the identification of the multiple deprivations poor people face with respect to education, health and other living standard indicators. Poverty estimates show that there are significant within-country regional disparities in the prevalence of poverty in both countries. For instance, the percentage of people who are multidimensionally poor in the five poorest counties of Kenya (Wajir, Garissa, Marsabit, Samburu and Turkana) is at least two times higher than that of the three richest counties (Nairobi, Kiambu and Nyeri). Likewise, the percentage of people who are multidimensionally poor in the five poorest districts of Zambia is two times higher than that of the five richest districts. A comparison of multidimensional poverty and income poverty estimates at district (Zambia) and county (Kenya) levels suggests that areas characterised by high levels of multidimensional poverty also have a higher incidence of income poverty. Comparison across time also shows substantial and

persistent regional disparities in education and access to basic services such as safe drinking water and improved sanitation in both countries.

Although the extent of multidimensional poverty is significantly higher in rural and remote areas than urban areas in both countries, poverty estimates at lower levels of geographic aggregation (e.g. constituency level) show that there are also large differences in the incidence of poverty among urban areas and areas within large cities. Looking at deprivation levels across time reveals that, although the proportion of people with access to basic services such as safe drinking water and improved sanitation is larger in large urban centres in both countries, it is the major urban areas where deprivation levels have increased significantly over time. These findings suggest that the extent of provision of basic infrastructure services such as access to safe drinking water and improved sanitation does not match the extent required to accommodate rapid urban growth in the large urban centres of both countries.

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Appendix A: Kenya

Table 1A: Multidimensional and income poverty estimates at county level in Kenya, 2009.

County	Multidimensional poverty and inequality					Income poverty and inequality		
	MPI	H (%)	A (%)	Conti. (%)	variance	H (%)	Conti.	Gini
Nairobi	0.126	27	46	3.5	0.13	22	3.94	0.34
Kiambu	0.16	34	46	2.3	0.14	24	2.28	0.34
Nyeri	0.197	41	48	1.2	0.14	28	1.1	0.37
Nyandarua	0.208	44	48	1.1	0.12	39	1.33	0.39
Mombasa	0.209	44	48	1.7	0.16	35	1.88	0.37
Uasin Gishu	0.215	45	48	1.7	0.14	34	1.73	0.37
Nakuru	0.22	45	49	3.2	0.15	34	3.08	0.38
Kirinyaga	0.237	48	49	1.1	0.15	26	0.8	0.35
Murang'a	0.238	48	50	2	0.15	33	1.83	0.36
Machakos	0.24	48	50	2.4	0.15	43	2.72	0.4
Makueni	0.241	48	50	2	0.14	61	3.12	0.38
Embu	0.25	50	51	1.2	0.16	35	1.06	0.38
Kisumu	0.252	50	50	2.2	0.16	40	2.23	0.43
Laikipia	0.255	49	52	0.9	0.17	48	1.09	0.37
Taita-Taveta	0.263	53	50	0.7	0.16	50	0.82	0.44
Kajiado	0.264	51	52	1.6	0.19	38	1.51	0.4
Bomet	0.265	52	51	1.7	0.13	51	2.18	0.34
Nyamira	0.268	53	50	1.5	0.15	51	1.77	0.39
Kericho	0.269	54	50	1.8	0.15	39	1.71	0.38
Elgeyo-Marakwet	0.275	52	53	0.9	0.16	53	1.14	0.36
Tharaka-Nithi	0.275	53	52	0.9	0.17	41	0.87	0.4
Bungoma	0.278	56	50	3.5	0.16	47	3.79	0.43
Kakamega	0.28	56	50	4.3	0.16	49	4.77	0.39
Vihiga	0.28	57	50	1.4	0.16	39	1.26	0.4
Trans-Nzoia	0.282	56	50	2.1	0.16	41	1.96	0.36
Kisii	0.287	56	51	3	0.16	51	3.45	0.42
Meru	0.292	58	51	3.6	0.17	31	2.44	0.35
Nandi	0.292	57	51	2	0.15	40	1.74	0.34
Siaya	0.303	57	53	2.3	0.17	38	1.87	0.41
Busia	0.304	59	52	2	0.17	60	2.61	0.46
Kitui	0.307	58	53	2.8	0.16	60	3.48	0.39
Migori	0.307	58	53	2.6	0.17	50	2.65	0.46

County	Multidimensional poverty and inequality					Income poverty and inequality		
	MPI	H (%)	A (%)	Conti. (%)	variance	H (%)	Conti.	Gini
Homa Bay	0.312	58	54	2.7	0.17	48	2.72	0.42
Lamu	0.327	62	53	0.3	0.17	32	0.19	0.47
Baringo	0.354	61	58	1.8	0.21	52	1.69	0.36
Narok	0.365	67	55	2.8	0.15	41	2.02	0.31
Kilifi	0.375	69	54	3.7	0.18	58	3.74	0.56
Kwale	0.394	71	55	2.3	0.17	71	2.67	0.6
Isiolo	0.441	77	58	0.6	0.19	65	0.73	0.43
Mandera	0.455	80	57	4.3	0.15	86	4.69	0.33
Tana River	0.465	79	59	1	0.17	76	1.06	0.62
Wajir	0.48	83	58	2.9	0.14	84	2.59	0.32
Garissa	0.486	83	58	2.8	0.15	59	1.46	0.44
West Pokot	0.496	81	61	2.3	0.18	66	1.89	0.32
Marsabit	0.527	86	61	1.4	0.17	76	1.29	0.37
Samburu	0.536	86	62	1.1	0.16	71	0.93	0.33
Turkana	0.618	93	67	4.7	0.12	88	4.13	0.28

Source: Authors' multidimensional poverty estimations and income poverty estimates obtained from KNBS

Table 2A: Multidimensional poverty estimates at constituency level in Kenya, 2009.

County	Constituency	MPI	Headcount	Intensity
Nairobi	Dagoretti	0.141	31.4	45.1
Nairobi	Starehe	0.131	26.9	48.6
Nairobi	Kamukunji	0.164	33.2	49.2
Nairobi	Makadara	0.125	28.2	44.3
Nairobi	Embakasi	0.102	22.7	44.9
Nairobi	Kasarani	0.113	24.2	46.7
Nairobi	Westlands	0.096	20.7	46.1
Nairobi	Lang'ata	0.186	41.2	45.0
Nyandarua	Kipipiri	0.218	45.0	48.4
Nyandarua	Kinangop	0.199	42.5	46.8
Nyandarua	Ndaragwa	0.195	41.2	47.4
Nyandarua	Oi Kalou	0.218	45.1	48.4
Nyeri	Kieni	0.205	43.0	47.6
Nyeri	Tetu	0.193	40.9	47.3
Nyeri	Othaya	0.199	41.7	47.7
Nyeri	Mukurweini	0.215	43.4	49.5
Nyeri	Nyeri Town	0.172	36.2	47.5
Nyeri	Mathira	0.198	41.5	47.6
Kirinyaga	Mwea	0.260	51.5	50.5
Kirinyaga	Ndia	0.224	46.3	48.4
Kirinyaga	Kerugoya/Kutus	0.221	45.8	48.3
Kirinyaga	Gichugu	0.226	46.6	48.5
Murang'a	Mathioya	0.228	47.4	48.1
Murang'a	Kandara	0.250	49.1	51.0
Murang'a	Gatanga	0.221	45.2	48.8
Murang'a	Kangema	0.232	48.4	47.9
Murang'a	Kigumo	0.258	50.4	51.2
Murang'a	Kiharu	0.216	44.0	49.1
Murang'a	Maragwa	0.260	50.0	52.0
Kiambu	Gatundu South	0.201	42.4	47.4
Kiambu	Gatundu North	0.215	45.9	46.9
Kiambu	Limuru	0.190	41.6	45.6
Kiambu	Kabete	0.141	31.3	44.9
Kiambu	Juja	0.123	26.6	46.1
Kiambu	Githunguri	0.182	38.5	47.2
Kiambu	Kiambaa	0.148	32.4	45.7
Kiambu	Lari	0.222	45.7	48.6
Mombasa	Mvita	0.118	25.6	46.2

County	Constituency	MPI	Headcount	Intensity
Mombasa	Likoni	0.230	48.4	47.4
Mombasa	Changamwe	0.226	47.8	47.3
Mombasa	Kisauni	0.206	43.1	47.8
Kwale	Msambweni	0.374	67.9	55.0
Kwale	Kinango	0.432	75.9	57.0
Kwale	Matuga	0.376	69.8	53.9
Kilifi	Bahari	0.342	66.3	51.5
Kilifi	Malindi	0.307	59.4	51.7
Kilifi	Kaloleni	0.408	74.4	54.9
Kilifi	Ganze	0.445	77.5	57.4
Kilifi	Magarini	0.437	75.2	58.1
Tana River	Galole	0.428	74.2	57.7
Tana River	Bura	0.506	84.8	59.6
Tana River	Garsen	0.453	77.9	58.1
Lamu	Lamu East	0.457	83.9	54.4
Lamu	Lamu West	0.299	57.1	52.3
Taita-Taveta	Wundanyi	0.248	49.0	50.7
Taita-Taveta	Voi	0.269	55.6	48.4
Taita-Taveta	Taveta	0.262	51.9	50.5
Taita-Taveta	Mwatate	0.269	54.3	49.5
Marsabit	North Horr	0.637	94.7	67.3
Marsabit	Laisamis	0.608	94.1	64.6
Marsabit	Moyale	0.451	79.4	56.7
Marsabit	Saku	0.410	74.2	55.3
Isiolo	Isiolo North	0.415	72.8	57.1
Isiolo	Isiolo South	0.499	85.6	58.4
Meru	Igembe	0.363	69.0	52.7
Meru	Tigania West	0.281	56.0	50.2
Meru	North Imenti	0.208	44.4	46.9
Meru	Central Imenti	0.207	43.2	47.8
Meru	Tigania East	0.350	66.6	52.6
Meru	South Imenti	0.227	46.9	48.3
Meru	Ntonyiri	0.375	71.4	52.5
Tharaka	Tharaka	0.328	60.6	54.1
Tharaka	Nithi	0.246	48.4	50.7
Embu	Siakago	0.289	55.3	52.3
Embu	Runyenjes	0.257	50.8	50.5
Embu	Manyatta	0.221	44.9	49.2
Embu	Gachoka	0.252	49.7	50.6

County	Constituency	MPI	Headcount	Intensity
Kitui	Kitui Central	0.281	54.6	51.5
Kitui	Mwingi South	0.285	54.7	52.1
Kitui	Kitui West	0.252	50.3	50.1
Kitui	Kitui South	0.316	59.1	53.5
Kitui	Mwingi North	0.362	65.5	55.2
Kitui	Mutito	0.338	62.1	54.5
Machakos	Kathiani	0.224	46.3	48.4
Machakos	Masinga	0.265	50.7	52.3
Machakos	Machakos Town	0.234	47.8	48.9
Machakos	Kangundo	0.237	47.5	49.8
Machakos	Mwala	0.250	50.3	49.8
Machakos	Yatta	0.247	48.3	51.1
Makueni	Mbooni	0.267	50.8	52.5
Makueni	Kibwezi	0.232	48.1	48.2
Makueni	Makueni	0.224	45.5	49.3
Makueni	Kilome	0.239	47.6	50.2
Makueni	Kaiti	0.253	49.9	50.7
Garissa	Lagdera	0.546	91.0	60.0
Garissa	Ijara	0.464	79.9	58.0
Garissa	Dujis	0.397	71.7	55.4
Garissa	Fafi	0.530	90.6	58.5
Wajir	Wajir West	0.503	85.0	59.2
Wajir	Wajir North	0.492	82.5	59.6
Wajir	Wajir East	0.461	82.0	56.2
Wajir	Wajir South	0.470	82.3	57.0
Mandera	Mandera East	0.434	79.7	54.5
Mandera	Mandera West	0.491	80.9	60.7
Mandera	Mandera Central	0.442	78.2	56.5
Siaya	Rarieda	0.300	54.4	55.2
Siaya	Bondo	0.280	52.5	53.4
Siaya	Gem	0.324	60.8	53.3
Siaya	Alego	0.308	57.3	53.7
Siaya	Ugenya	0.302	58.4	51.8
Kisumu	Kisumu Town East	0.213	46.0	46.2
Kisumu	Kisumu Rural	0.303	56.6	53.5
Kisumu	Nyando	0.259	51.1	50.6
Kisumu	Nyakach	0.263	51.4	51.1
Kisumu	Muhoroni	0.285	55.1	51.8
Kisumu	Kisumu Town West	0.222	45.1	49.3

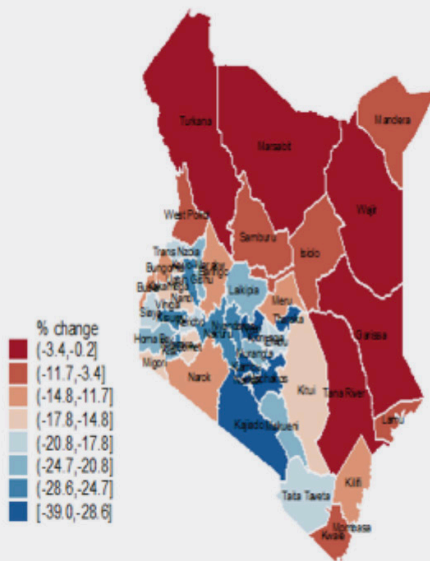
County	Constituency	MPI	Headcount	Intensity
Migori	Nyatike	0.353	62.9	56.2
Migori	Migori	0.316	60.0	52.6
Migori	Rongo	0.281	53.9	52.1
Migori	Kuria	0.294	56.2	52.4
Migori	Uriri	0.309	58.2	53.1
Homa Bay	Gwasi	0.346	62.8	55.2
Homa Bay	Karachuonyo	0.297	55.5	53.6
Homa Bay	Rangwe	0.306	57.1	53.5
Homa Bay	Ndhiwa	0.343	61.6	55.7
Homa Bay	Kasipul Kabondo	0.284	55.0	51.7
Homa Bay	Mbita	0.320	58.5	54.7
Kisii	Kitutu Chache	0.300	58.6	51.3
Kisii	Bobasi	0.279	54.5	51.1
Kisii	Bonchari	0.309	59.1	52.2
Kisii	Nyaribari Masaba	0.253	49.7	50.9
Kisii	Bomachoge	0.296	58.0	51.0
Kisii	Nyaribari Chache	0.246	50.9	48.4
Kisii	South Mugirango	0.313	60.3	51.8
Nyamira	West Mugirango	0.267	53.0	50.3
Nyamira	North Mugirango	0.284	55.3	51.4
Nyamira	Kitutu Masaba	0.249	50.8	49.1
Turkana	Turkana South	0.567	88.2	64.3
Turkana	Turkana Central	0.609	92.1	66.1
Turkana	Turkana North	0.656	96.5	67.9
West Pokot	Sigor	0.474	79.2	59.8
West Pokot	Kacheliba	0.607	92.5	65.7
West Pokot	Kapenguria	0.420	72.7	57.7
Samburu	Samburu East	0.573	89.9	63.8
Samburu	Samburu West	0.523	84.9	61.6
Trans-Nzoia	Saboti	0.270	54.9	49.1
Trans-Nzoia	Kwanza	0.309	59.8	51.7
Trans-Nzoia	Cherangany	0.272	53.6	50.8
Baringo	Baringo Central	0.289	53.8	53.7
Baringo	Baringo East	0.598	90.8	65.9
Baringo	Eldama Ravine	0.237	47.0	50.4
Baringo	Mogotio	0.273	51.1	53.5
Baringo	Baringo North	0.307	55.6	55.2
Uasin Gishu	Eldoret North	0.223	46.5	48.0
Uasin Gishu	Eldoret South	0.220	46.1	47.9

County	Constituency	MPI	Headcount	Intensity
Uasin Gishu	Eldoret East	0.194	40.8	47.5
Elgeyo-Marakwet	Marakwet East	0.369	64.7	57.0
Elgeyo-Marakwet	Keiyo South	0.239	46.4	51.5
Elgeyo-Marakwet	Keiyo North	0.232	45.4	51.2
Elgeyo-Marakwet	Marakwet West	0.273	52.7	51.9
Nandi	Emgwen	0.288	56.4	51.0
Nandi	Aldai	0.296	57.3	51.6
Nandi	Mosop	0.262	52.1	50.3
Nandi	Tinderet	0.320	62.7	51.0
Laikipia	Laikipia East	0.256	48.9	52.4
Laikipia	Laikipia West	0.254	49.2	51.6
Nakuru	Kuresoi	0.284	55.1	51.6
Nakuru	Nakuru Town	0.132	29.2	45.0
Nakuru	Molo	0.261	53.2	49.0
Nakuru	Subukia	0.202	42.4	47.6
Nakuru	Rongai	0.231	46.1	50.1
Nakuru	Naivasha	0.222	47.1	47.1
Narok	Narok North	0.351	65.7	53.3
Narok	Kilgoris	0.347	64.1	54.1
Narok	Narok South	0.393	69.3	56.6
Kajiado	Kajiado South	0.347	65.1	53.3
Kajiado	Kajiado North	0.200	40.8	49.1
Kajiado	Kajiado Central	0.342	63.9	53.5
Kericho	Ainamoi	0.259	51.8	50.0
Kericho	Belgut	0.275	55.6	49.6
Kericho	Bureti	0.249	49.0	50.8
Kericho	Kipkelion	0.289	56.5	51.1
Bomet	Chepalungu	0.268	52.1	51.4
Bomet	Bomet	0.267	51.8	51.5
Bomet	Konoin	0.283	57.5	49.3
Bomet	Sotik	0.247	48.5	50.9
Kakamega	Mumias	0.291	58.5	49.8
Kakamega	Matungu	0.313	62.3	50.3
Kakamega	Lugari	0.254	52.2	48.7
Kakamega	Ikolomani	0.313	61.8	50.7
Kakamega	Khwisero	0.309	60.6	51.0
Kakamega	Butere	0.310	60.4	51.3
Kakamega	Malava	0.252	51.3	49.2
Kakamega	Shinyalu	0.299	58.6	51.0

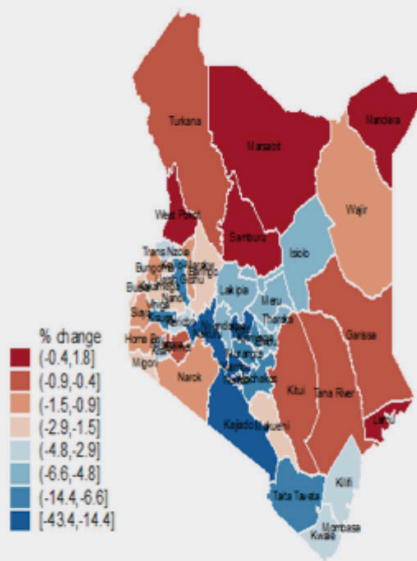
County	Constituency	MPI	Headcount	Intensity
Kakamega	Lurambi	0.257	52.3	49.1
Vihiga	Vihiga	0.259	53.6	48.3
Vihiga	Hamisi	0.293	58.2	50.4
Vihiga	Sabatia	0.251	52.9	47.5
Vihiga	Emuhaya	0.299	59.3	50.5
Bungoma	Kanduyi	0.259	53.4	48.4
Bungoma	Bumula	0.309	60.7	50.9
Bungoma	Kimilili	0.249	51.0	48.8
Bungoma	Mount Elgon	0.359	66.3	54.2
Bungoma	Sirisia	0.282	56.3	50.1
Bungoma	Webuye	0.250	51.2	48.9
Busia	Nambale	0.288	57.0	50.6
Busia	Budalangi	0.327	60.6	53.9
Busia	Butula	0.327	62.9	52.1
Busia	Amagoro	0.299	57.9	51.7
Busia	Funyula	0.307	59.4	51.7

Source: Author estimates using data from 2009 Kenya population census.

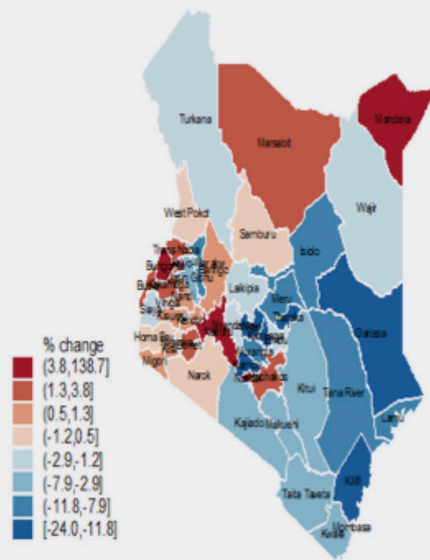
Change in education deprivation (%)



Change in electricity deprivation (%)



Change in water(pipe) deprivation (%)



Change in water deprivation (%)

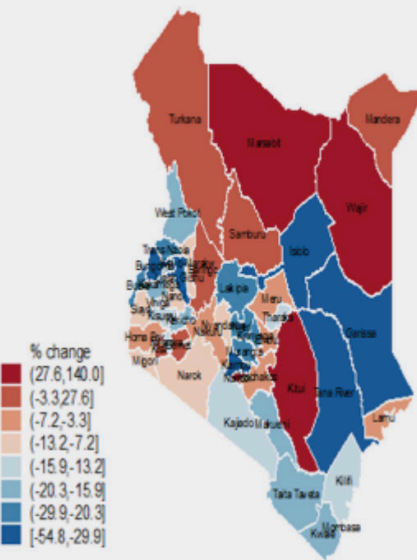


Figure 1A: Percentage change in deprivations in education and access to basic services (Kenya, 1999 & 2009).

Source: Author estimates using data from the 1999 and 2009 Kenya population censuses.

Appendix B: Zambia

Table 1B: Multidimensional and income poverty estimates at district level in Zambia, 2010.

Province	District	Multidimensional poverty estimates				Income poverty estimates
		MPI	H (%)	A (%)	Variance	H (%)
Central	Chibombo	0.295	55.7	52.9	0.15	73
Central	Kabwe	0.222	43.3	51.2	0.23	33
Central	Kapiri mpos	0.322	59.7	53.9	0.16	68
Central	Mkushi	0.354	63.8	55.5	0.17	71
Central	Mumbwa	0.289	55.3	52.3	0.15	64
Central	Serenje	0.408	70.3	58	0.18	78
Copperbelt	Chililabomb	0.159	31.1	51.2	0.21	30
Copperbelt	Chingola	0.174	35.6	48.9	0.2	32
Copperbelt	Kalulushi	0.224	44	51	0.22	30
Copperbelt	Kitwe	0.21	42.3	49.6	0.22	29
Copperbelt	Luanshya	0.177	36	49.3	0.21	33
Copperbelt	Lufwanyama	0.353	63.1	55.9	0.15	80
Copperbelt	Masaiti	0.355	63.6	55.9	0.16	51
Copperbelt	Mpongwe	0.334	60.2	55.5	0.17	71
Copperbelt	Mufulira	0.168	33.8	49.8	0.21	30
Copperbelt	Ndola	0.23	45.9	50	0.22	31
Eastern	Chadiza	0.387	69.8	55.4	0.16	81
Eastern	Chipata	0.34	62.8	54	0.18	72
Eastern	Katete	0.38	70.7	53.7	0.15	82
Eastern	Lundazi	0.404	70.7	57.1	0.16	84
Eastern	Mambwe	0.362	65.7	55.1	0.17	81
Eastern	Nyimba	0.416	74	56.2	0.17	78
Eastern	Petauke	0.39	70.9	55	0.16	82
Luapula	Chiengwe	0.466	78.4	59.4	0.16	82
Luapula	Kawambwa	0.379	67.4	56.2	0.17	82
Luapula	Mansa	0.351	62.3	56.3	0.19	65
Luapula	Milenge	0.457	77.2	59.2	0.16	88
Luapula	Mwense	0.399	69.9	57.1	0.17	79
Luapula	Nchelenge	0.423	73.5	57.6	0.17	77
Luapula	Samfya	0.471	78.2	60.2	0.17	91
Lusaka	Chongwe	0.301	56.2	53.5	0.19	61
Lusaka	Kafue	0.249	48.1	51.8	0.22	40
Lusaka	Luangwa	0.368	65.7	55.9	0.19	70
Lusaka	Lusaka	0.206	42.9	48.1	0.19	18
Muchinga	Chama	0.428	73.9	58	0.16	71

Province	District	Multidimensional poverty estimates				Income poverty estimates
		MPI	H (%)	A (%)	Variance	H (%)
Muchinga	Chinsali	0.411	70.6	58.2	0.17	85
Muchinga	Isoka	0.399	69	57.7	0.16	86
Muchinga	Mpika	0.385	67.4	57.1	0.18	74
Muchinga	Nakonde	0.372	67.2	55.3	0.17	72
Northern	Chilubi	0.475	78.9	60.2	0.16	87
Northern	Kaputa	0.463	78.7	58.8	0.16	79
Northern	Kasama	0.339	61.1	55.4	0.19	51
Northern	Luwingu	0.427	72.9	58.6	0.17	86
Northern	Mbala	0.443	75	59.1	0.18	82
Northern	Mporokoso	0.378	66	57.3	0.16	82
Northern	Mpulungu	0.479	80.5	59.4	0.17	81
Northern	Mungwi	0.434	73.7	58.8	0.16	86
North western	Chavuma	0.443	74.5	59.4	0.18	87
North western	Kabompo	0.416	71.9	57.9	0.17	90
North western	Kasempa	0.378	67.2	56.2	0.18	81
North western	Mufumbwe	0.346	62.2	55.5	0.17	87
North western	Mwinilunga	0.44	74.5	59.1	0.18	36
North western	Solwezi	0.336	61.6	54.6	0.19	50
North western	Zambezi	0.451	75.1	60.1	0.17	87
Southern	Choma	0.302	56.6	53.3	0.18	72
Southern	Gwembe	0.412	73.7	55.8	0.16	82
Southern	Itezhi tezh	0.365	65.2	56	0.17	70
Southern	Kalomo	0.341	62.5	54.5	0.16	75
Southern	Kazungula	0.362	65.1	55.6	0.15	68
Southern	Livingstone	0.188	39	48.3	0.21	28
Southern	Mazabuka	0.252	48.3	52.1	0.19	63
Southern	Monze	0.258	50.4	51.2	0.15	75
Southern	Namwala	0.337	61.9	54.5	0.16	72
Southern	Siavonga	0.426	74.3	57.3	0.2	72
Southern	Sinazongwe	0.395	69.9	56.5	0.19	77
Western	Kalabo	0.525	84.7	62	0.15	88
Western	Kaoma	0.437	74.7	58.5	0.18	82
Western	Lukulu	0.484	80.6	60	0.16	86
Western	Mongu	0.398	69.6	57.2	0.21	71
Western	Senanga	0.479	79.5	60.2	0.17	87
Western	Sesheke	0.41	70.5	58.1	0.19	85
Western	Shang'ombo	0.544	86.5	62.8	0.14	95

Source: Authors multidimensional poverty estimations and income poverty estimates as obtained from De la Fuente, et al. (2015).

Table 2B: Multidimensional poverty estimates at constituency level in Zambia, 2010.

Province	District	Constituency	MPI	Headcount	Intensity
Central	Chibombo	Chisamba	0.283	53.3	53.2
Central	Chibombo	Katuba	0.311	59.5	52.4
Central	Chibombo	Keembe	0.293	55.3	53.0
Central	Kabwe	Bwacha	0.274	52.7	52.0
Central	Kabwe	Kabwe central	0.184	36.5	50.4
Central	Kapiri mposhi	Kapiri mposhi	0.322	59.7	53.9
Central	Mkushi	Mkushi north	0.350	63.5	55.2
Central	Mkushi	Mkushi south	0.372	65.5	56.8
Central	Mumbwa	Mwembezhi	0.294	56.8	51.8
Central	Mumbwa	Mumbwa	0.309	58.0	53.3
Central	Mumbwa	Nangoma	0.265	51.4	51.5
Central	Serenje	Chitambo	0.442	75.7	58.4
Central	Serenje	Muchinga	0.422	71.9	58.7
Central	Serenje	Serenje	0.369	64.9	56.9
Copperbelt	Chililabombwe	Chililabombwe	0.159	31.1	51.2
Copperbelt	Chingola	Chingola	0.187	38.6	48.6
Copperbelt	Chingola	Nchanga	0.155	31.3	49.5
Copperbelt	kalulushi	Kalulushi	0.224	44.0	51.0
Copperbelt	Kitwe	Chimwemwe	0.265	52.4	50.7
Copperbelt	Kitwe	Kamfinsa	0.233	46.6	50.1
Copperbelt	Kitwe	Kwacha	0.238	47.4	50.2
Copperbelt	Kitwe	Nkana	0.143	31.1	45.8
Copperbelt	Kitwe	Wusakile	0.139	28.4	49.0
Copperbelt	Luanshya	Luanshya	0.215	42.6	50.5
Copperbelt	Luanshya	Roan	0.110	24.2	45.4
Copperbelt	Lufwanyama	Lufwanyama	0.353	63.1	55.9
Copperbelt	Masaiti	Kafulafuta	0.379	67.7	55.9
Copperbelt	Masaiti	Masaiti	0.339	60.7	55.9
Copperbelt	Mpongwe	Mpongwe	0.334	60.2	55.5
Copperbelt	Mufulira	Kankoyo	0.159	33.7	47.2
Copperbelt	Mufulira	Kantanshi	0.102	19.9	51.0
Copperbelt	Mufulira	Mufurila	0.237	46.7	50.7
Copperbelt	Ndola	Bwana mkubwa	0.229	45.1	50.9
Copperbelt	Ndola	Chifubu	0.182	38.2	47.6
Copperbelt	Ndola	Kabushi	0.187	41.5	44.9
Copperbelt	Ndola	Ndola	0.294	55.4	53.1
Eastern	Chadiza	Chadiza	0.366	67.3	54.4
Eastern	Chadiza	Vubwi	0.417	73.3	56.8

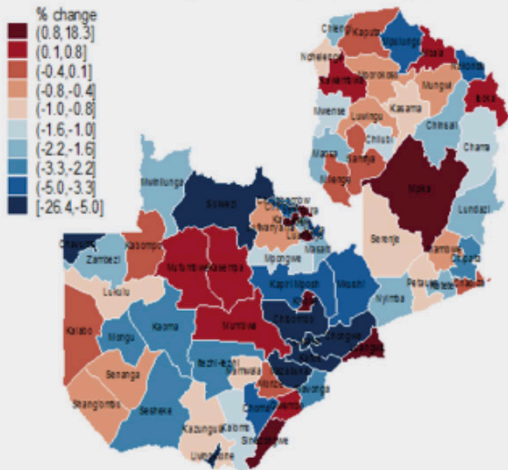
Province	District	Constituency	MPI	Headcount	Intensity
Eastern	Chipata	Chipangali	0.382	68.3	56.0
Eastern	Chipata	Chipata central	0.277	53.1	52.1
Eastern	Chipata	Kasenengwa	0.363	67.6	53.7
Eastern	Chipata	Luangeni	0.374	68.6	54.5
Eastern	Katete	Milanzi	0.398	73.1	54.4
Eastern	Katete	Mkaika	0.347	65.7	52.8
Eastern	Katete	Sinda	0.403	74.5	54.1
Eastern	Lundazi	Chasefu	0.410	71.5	57.4
Eastern	Lundazi	Lumezi	0.425	73.7	57.7
Eastern	Lundazi	Lundazi	0.383	68.0	56.3
Eastern	Mambwe	Malambo	0.362	65.7	55.1
Eastern	Nyimba	Nyimba	0.416	74.0	56.2
Eastern	Petauke	Kapoche	0.420	74.7	56.2
Eastern	Petauke	Msanzala	0.362	67.2	53.8
Eastern	Petauke	Petauke	0.386	70.5	54.7
Luapula	Chienge	Chienge	0.466	78.4	59.4
Luapula	Kawambwa	Kawambwa	0.331	60.8	54.4
Luapula	Kawambwa	Mwansabombwe	0.395	70.0	56.5
Luapula	Kawambwa	Pambashe	0.417	72.2	57.8
Luapula	Mansa	Bahati	0.373	65.4	57.1
Luapula	Mansa	Mansa	0.336	60.3	55.7
Luapula	Milenge	Chembe	0.457	77.2	59.2
Luapula	Mwense	Chipili	0.414	71.6	57.8
Luapula	Mwense	Mambilima	0.400	70.2	57.0
Luapula	Mwense	Mwense	0.390	68.8	56.7
Luapula	Nchelenge	Nchelenge	0.423	73.5	57.6
Luapula	Samfya	Bangweulu	0.445	75.2	59.2
Luapula	Samfya	Chifunabuli	0.474	78.7	60.3
Luapula	Samfya	Luapula	0.555	88.0	63.1
Lusaka	Chongwe	Chongwe	0.275	52.5	52.4
Lusaka	Chongwe	Rufunsa	0.376	67.1	56.0
Lusaka	Kafue	Kafue	0.260	50.0	52.0
Lusaka	Kafue	Chilanga	0.237	46.0	51.5
Lusaka	Luangwa	Feira	0.368	65.7	55.9
Lusaka	Lusaka	Chawama	0.270	55.3	48.8
Lusaka	Lusaka	Kabwata	0.081	17.4	46.2
Lusaka	Lusaka	Kanyama	0.254	52.9	48.0
Lusaka	Lusaka	Lusaka central	0.111	22.7	49.0
Lusaka	Lusaka	Mandevu	0.253	52.0	48.6

Province	District	Constituency	MPI	Headcount	Intensity
Lusaka	Lusaka	Matero	0.202	42.9	47.2
Lusaka	Lusaka	Munali	0.156	32.8	47.7
Muchinga	Chama	Chama north	0.411	71.3	57.6
Muchinga	Chama	Chama south	0.447	76.5	58.4
Muchinga	Chinsali	Chinsali	0.403	69.7	57.8
Muchinga	Chinsali	Shiwa-ng'andu	0.424	72.0	58.8
Muchinga	Isoka	Isoka	0.380	66.6	57.0
Muchinga	Mafinga	Mafinga	0.419	71.6	58.4
Muchinga	Mpika	Kanchibiya	0.447	76.3	58.6
Muchinga	Mpika	Mfuwe	0.448	75.6	59.2
Muchinga	Mpika	Mpika	0.314	57.4	54.6
Muchinga	Nakonde	Nakonde	0.372	67.2	55.3
Northern	Chilubi	Chilubi	0.475	78.9	60.2
Northern	Kaputa	Chimbamilonga	0.486	81.9	59.3
Northern	Kaputa	Kaputa	0.448	76.6	58.4
Northern	Kasama	Kasama central	0.316	58.0	54.5
Northern	Kasama	Lukasha	0.387	67.8	57.0
Northern	Luwingu	Lubansenshi	0.383	66.6	57.6
Northern	Luwingu	Lupososhi	0.459	77.5	59.2
Northern	Mbala	Mbala	0.427	73.0	58.5
Northern	Mbala	Senga hill	0.462	77.5	59.7
Northern	Mporokoso	Lunte	0.392	67.8	57.8
Northern	Mporokoso	Mporokoso	0.358	63.3	56.5
Northern	Mpulungu	Mpulungu	0.479	80.5	59.4
Northern	Mungwi	Malole	0.434	73.7	58.8
North western	Chavuma	Chavuma	0.443	74.5	59.4
North western	Ikelenge	Ikelenge	0.446	75.9	58.7
North western	Kabompo	Kabompo east	0.413	70.9	58.2
North western	Kabompo	Kabompo west	0.419	72.9	57.5
North western	Kasempa	Kasempa	0.378	67.2	56.2
North western	Mufumbwe (chizera)	Mufumbwe	0.346	62.2	55.5
North western	Mwinilunga	Mwinilunga	0.438	74.0	59.2
North western	Solwezi	Solwezi central	0.289	54.8	52.8
North western	Solwezi	Solwezi east	0.404	72.6	55.6
North western	Solwezi	Solwezi west	0.384	67.8	56.6
North western	Zambezi	Zambezi east	0.434	73.0	59.5
North western	Zambezi	Zambezi west	0.493	80.3	61.4
Southern	Choma	Choma	0.290	55.1	52.7
Southern	Choma	Mbabala	0.304	56.9	53.5

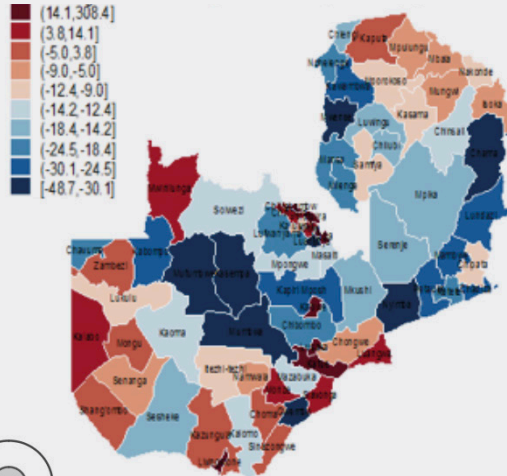
Province	District	Constituency	MPI	Headcount	Intensity
Southern	Choma	Pemba	0.321	59.2	54.2
Southern	Gwembe	Gwembe	0.412	73.7	55.8
Southern	Itezhi tezhi	Itezhi tezhi	0.365	65.2	56.0
Southern	Kalomo	Dundumwenze	0.362	66.6	54.4
Southern	Kalomo	Kalomo central	0.302	56.9	53.1
Southern	Kalomo	Mapatizya	0.376	66.5	56.6
Southern	Kazungula	Katombola	0.362	65.1	55.6
Southern	Livingstone	Livingstone	0.188	39.0	48.3
Southern	Mazabuka	Chikankanta	0.311	57.4	54.1
Southern	Mazabuka	Magoye	0.293	55.2	53.1
Southern	Mazabuka	Mazabuka central	0.188	38.1	49.4
Southern	Monze	Bweenga	0.284	55.0	51.7
Southern	Monze	Monze central	0.241	47.4	50.8
Southern	Monze	Moomba	0.266	51.4	51.7
Southern	Namwala	Namwala	0.337	61.9	54.5
Southern	Siavonga	Siavonga	0.426	74.3	57.3
Southern	Sinazongwe	Sinazongwe	0.395	69.9	56.5
Western	Kalabo	Kalabo central	0.500	82.4	60.7
Western	Kalabo	Liuwa	0.499	81.2	61.4
Western	Kalabo	Sikongo	0.571	89.6	63.8
Western	Kaoma	Kaoma central	0.368	65.5	56.1
Western	Kaoma	Luampa	0.488	81.3	60.1
Western	Kaoma	Mangango	0.498	83.1	59.9
Western	Lukulu	Lukulu east	0.462	78.6	58.8
Western	Lukulu	Lukulu west	0.529	84.7	62.5
Western	Mongu	Luena	0.422	71.9	58.7
Western	Mongu	Mongu central	0.336	62.3	54.0
Western	Mongu	Nalikwanda	0.504	82.9	60.8
Western	Senanga	Nalolo	0.497	81.6	60.9
Western	Senanga	Senanga	0.464	77.9	59.6
Western	Sesheke	Mulobezi	0.470	78.1	60.1
Western	Sesheke	Mwandi	0.388	68.3	56.8
Western	Sesheke	Sesheke	0.381	66.6	57.2
Western	Shang'ombo	Sinjembela	0.544	86.5	62.8

Source: Authors estimates using data from the 2010 Zambia population census.

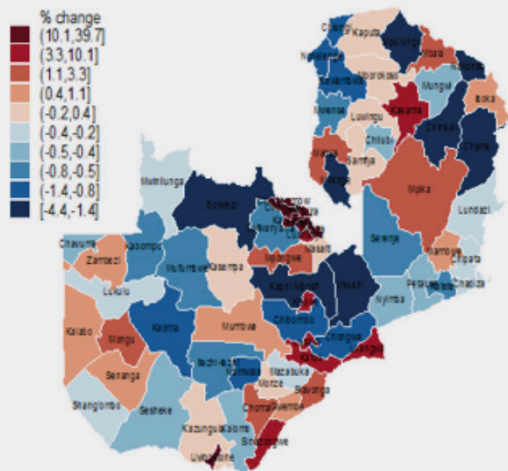
Change in education deprivation (%)



Change in water deprivation (%)



Change in sanitation deprivation (%)



Change in education deprivation (%)

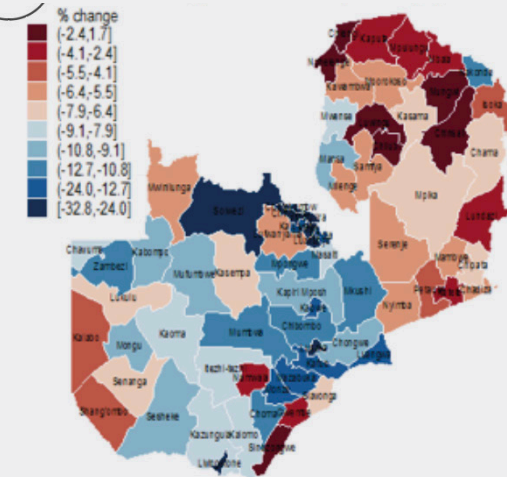


Figure 1B: Percentage change in deprivations in education and access to basic services (Zambia, 2000 & 2010).

Source: Author estimates using data from the 2000 and 2010 Zambia population censuses.

