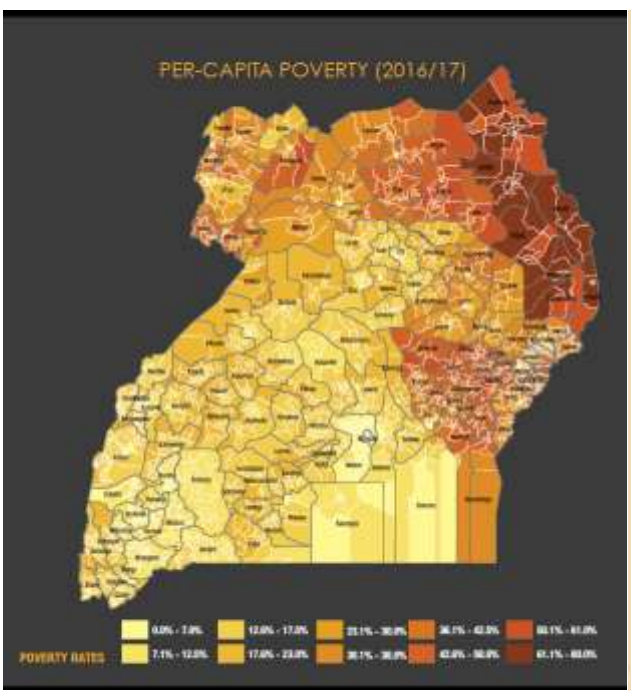
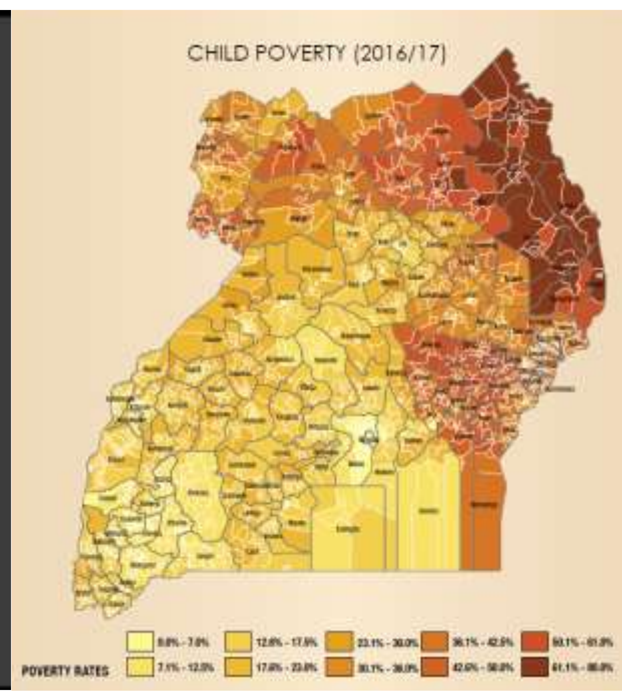
Poverty Maps of Uganda

Mapping the Spatial Distribution of Poor Households and Child Poverty Based on Data from the 2016/17 Uganda National Household Survey and the 2014 National Housing and Population Census

Technical Report

October 2019





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The core task team at UBOS consisted of Mr. James Muwonge (Director of Socio-Economic Surveys), Mr. Justus Bernard Muhwezi (Manager of Geo-Information Services), Mr. Stephen Baryahirwa (Principal Statistician and Head of the Household Surveys Unit), Mr. Vincent Ssennono (Principal Statistician and Head of the Methodology and Analysis Unit), and Mr. Adriku Charles (Senior Geo-Information Officer).

The core task team at the World Bank consisted of Dr. Nobuo Yoshida (Lead Economist), Dr. Carolina Mejia-Mantilla (Uganda Country Poverty Economist), Dr. Minh Cong Nguyen (Senior Economist) and Ms. Miyoko Asai (Consultant). Dr. Nobuo Yoshida and Dr. Minh Cong Nguyen supervised the exercise and ensured that the latest international experience and technical innovations were available to the team.

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I. Introduction

Over the past two decades, Uganda has achieved remarkable economic growth and substantial poverty reduction. The share of the Ugandan population living below the national poverty line fell from 31.1 percent in 2006 to 19.7 percent in 2013 (UBOS 2013). Meanwhile, the share of the population living on less than US$1.90 per day dropped from 53.2 percent in 2006 to 34.6 percent in 2013, one of the fastest declines in Sub-Saharan Africa (World Bank 2016).

However, the 2016/2017 drought stalled the pace of poverty reduction. According to the World Bank's recent report (World Bank 2019), the poverty rate increased by 1.7 percentage points since 2013 to 21.4 percent. Also, the 2016 drought changed the geography of poverty in the country. For example, the poorest region in the country had always been the northern region until 2013, but it is now the eastern region. As of 2016, the poverty headcount rate in the northern region was 32.5 percent while that of the eastern region was 35.7 percent.

Of the total population living below the national poverty line, the share located in the northern region reduced between 2013 and 2017, from 44 percent to 33 percent (under the national poverty line). In eastern region, out of the total number of poor individuals, the proportion who live in the eastern region increased between 2013 and 2017, from 25 percent to 36 percent. It is likely that even bigger changes might be happening below the regional level. This motivates the update of poverty maps – poverty estimates below the regional level.

Calculating the National Poverty Line

Uganda's national poverty line reflects the estimated cost of meeting basic caloric requirements adjusted for age, gender, and daily activities. The cost of obtaining calories is based on the food basket consumed by the poorest 50 percent of Ugandans in 1993/94. In recognition of changing consumption patterns over the past two decades, the consumption-expenditure module has been expanded to include new types of consumption.

A monetary welfare aggregate based on per capita household consumption expenditure is computed using a detailed consumption-expenditure module included in the household surveys implemented by UBOS every three years. Both food and non-food expenditures are collected over a 12-month period to capture seasonal factors that influence household consumption.

The absolute poverty line was defined by Appleton et al. (1999), following the method developed by Ravallion and Bidani (1994). This method focused on the cost of meeting caloric needs, given the food basket of the poorest half of the population and some allowance for non-food needs. The food poverty line is based on a 3000-calorie food basket, and individual caloric requirements are adjusted according to the methodology used by the WHO (1985).

National poverty rates are expressed in adult-equivalent terms to account for variations in the age and gender of household members. The average annual consumption expenditure per adult equivalent in 2016/17 prices is UGX 46,233.65, which is Uganda's current national poverty line. However, statistics based on the national poverty line mask variations in the incidence and severity of poverty across regions and districts. Statistically rigorous, regularly updated poverty maps can greatly enhance the value of national statistics by shedding light on the spatial distribution of both monetary and nonmonetary poverty.

Following the last poverty mapping exercise, the Uganda Bureau of Statistics (UBOS), UNICEF, and the World Bank have launched a joint initiative to create new poverty maps at the sub-county level using the 2016/17 Uganda National Household Survey (UNHS) and the 2014 National Population and Housing Census (NPHS) following the small area estimation method developed by Elbers et al. (2003). Poverty mapping can be used to estimate poverty incidence for very small spatial areas, for which a typical household income and expenditure survey could not achieve statistically reliable estimates due to high sampling errors. In Uganda, official poverty rates are not produced below the sub-region level—the point at which sampling errors in the UNHS data become non-negligible. Various poverty-mapping methodologies have been devised to overcome the increasing imprecision of more geographically specific poverty estimates. Capitalizing on the extensive socioeconomic data collected by the 2016/17 UNHS and the universal coverage of the 2014 NPHC, the SAE methodology is used to generate four sets of poverty maps capturing regional heterogeneity at the district and sub-county levels, as well as a map of Kampala city uniquely disaggregated at the parish level.

Data-calibration challenges notwithstanding, all area-specific poverty estimations remain faithful to the national and regional poverty profiles issued when the 2016/17 UNHS was released. The creation of new districts and municipalities complicated the process of identifying common administrative areas across the 2016/17 UNHS and 2014 NPHC. The following report describes in detail all methodological considerations and validation techniques used to safeguard the analytical rigor of the poverty maps.

Like the 2012/13 poverty map, this report includes child-poverty estimates across all geographic regions. Close to 60 percent of the Ugandan population is under 18 years of age, and more than 75 percent is under the age of 35. Given this demographic profile, achieving the government's objective of reaching middle-income status by 2040 will hinge on its ability to ensure that today's children reach their full cognitive, socioemotional, and economic potential. In this context, the following report provides strategic guidance designed to improve the targeting of social welfare policies and prioritize distributional equity to reduce poverty and enhance household resilience, especially among vulnerable groups.

The remainder of the report is organized as follows. Section 2, below, outlines the SAE methodology, explores the dataset, and reviews several key technical challenges. Section 3 explains how the mapping exercise was performed and describes the statistical validation techniques used to verify its accuracy. Section 4 presents the main results of the exercise, including the poverty maps themselves. Section 5 concludes with some observations from the findings in Section 4.

II. Methodology and Data

II.1. Methodology

The SAE methodology has gained widespread popularity among development practitioners around the world.[1] The SAE approach assigns consumption levels to census households based on a consumption model estimated from a household survey. This consumption model includes explanatory variables (e.g., household and individual characteristics) that are statistically identical in both the census and the household survey. The consumption expenditures of census households are imputed by applying the estimated coefficients to the variables common to both the survey and census data. Poverty and inequality statistics for small areas are then calculated based on the imputed consumption of census households.

In addition to estimating poverty incidence, this approach also produces standard errors of poverty estimates. Poverty estimates are calculated with imputed consumption data and are subject to imputation errors. The authors analyzed the properties of such imputation errors in detail and computed the standard errors of SAE poverty estimates (see Box 1) following Elbers et al. (2003).

II.2. Main Data Sources

The SAE methodology requires data from a household survey and a population census. The NPHC covered roughly 7.3 million households. The census reference night was the night of August 27, 2014 and the enumeration was conducted on a *de facto* basis. Enumeration began on August 28 and continued to September 7, 2014.[2] The UBOS census team collected a wide range of information on household characteristics, including the age, gender, and education level of household members, their religious affiliation, their livelihood and employment status, the condition of their housing, and the features of their community. Like censuses in other countries, the 2014 NPHC did not include household consumption or income data, but its wide coverage of household characteristics sharpens the precision of imputed household consumption.

[1] For an overview of alternative poverty-mapping techniques, see Bigman and Deichmann (2000).
[2] See UBOS (2014) for more details.

Box 1: The SAE Methodology

The SAE approach developed by Elbers et al. (2003) involves two stages. In the first stage, a model of log per capita consumption expenditure ($\ln y_{ch}$) is estimated based on the 2016/17 UNHS data:

$$\ln y_{ch} = X_{ch}'\beta + Z'\gamma + u_{ch}$$

where X_{ch}' is the vector of explanatory variables for household *h* in cluster *c*, β is the vector of regression coefficients, Z' is the vector of location-specific variables, γ is the vector of coefficients, and u_{ch} is the regression residuals or errors due to the discrepancy between predicted household consumption and the actual value. This error term is decomposed into two independent components: $u_{ch} = \eta_c + \varepsilon_{ch}$, where η_c is a cluster-specific effect, and ε_{ch} is a household-specific effect. This error structure allows for both a location effect common to all households in the same area and heteroskedasticity in the household-specific errors. The location variables can be any level—district, sub-county, parish, enumeration area, or village—and can be drawn from any data source that includes all locations in the country. All parameters regarding the regression coefficients (β, γ) and distributions of the error terms are estimated by feasible generalized least square.

In the second stage of the analysis, poverty estimates and their standard errors are computed. There are two sources of errors in the estimation process: errors in the estimated regression coefficients ($\hat{\beta}$, $\hat{\gamma}$) and the error terms, both of which affect the accuracy of poverty estimates. To account for these sources of error when calculating poverty estimates and their standard errors, a simulated expenditure value for each census household is calculated with predicted log expenditure $X_{ch}'\hat{\beta} + Z'\hat{\gamma}$ and random draws from the estimated distributions of coefficient, $\hat{\beta}$, and the error terms, η_c and ε_{ch}. These simulations are repeated 100 times. For any given location (e.g., a district or sub-county), the mean across the 100 simulations provides a point estimate of the poverty statistic, and the standard deviation provides an estimate of the standard error.

The 2016/17 Uganda National Household Survey (UNHS) was the sixth in the series of household surveys conducted by UBOS since 1999. The 2016/17 UNHS was collected by the UBOS; it includes 15,000 households and 15 strata, and covered all the districts in Uganda. Field data collection was spread over a 12-month period from July 2016 to June 2017 to take care of seasonality factors and also enable comparability with previous surveys. Most variables are representative at the national and sub-regional levels. Notably, there were 15 sub-regions in 2016/17.

The UNHS surveys have had a nationwide coverage and have largely adopted a similar sample design using the population census as the sampling frame. A two-stage stratified sampling design was used. At the first stage, Enumeration Areas (EAs) were grouped by districts and rural-urban location, then drawn using Probability Proportional to Size (PPS). At the second stage, households which are the Ultimate Sampling Units were drawn using Systematic Random Sampling.[3]

The UNHS collects detailed information on consumption and income, and the data contains rich information on employment, ownership of assets, housing condition, and access to services such as education and health. The large set of variables helps precise imputation of household consumption into the census.

When designing the UNHS 2016/17, deliberate efforts were made to include variables that were common to both census and UNHS. Specifically, questions relating to housing conditions in the UNHS was a mirror image of those in the census. The prior synchronization of variables during the design of UNHS facilitated the matching of variables in both census and the survey. This synchronization and the interval between UNHS 2016/17 and Population Census 2014 represents a unique opportunity to produce precise estimates of poverty rates at a highly disaggregated level.

II.3. Technical Challenges

II.3.1. Evolving Administrative Boundaries and Classifications

Before a poverty-mapping exercise can be initiated, the geography file must be checked and updated. This file usually includes location codes for different administrative levels and dictates how these codes are organized. The poverty maps produced by the exercise will reflect the location-code system defined by the geography file.

In Uganda, the geography file consists of seven administrative levels: region, sub-region, district, county, sub-county, parish, and enumeration area. Another level, constituency, was not part of the NPHC location-code system and does not fully align with it.[4] For this round of poverty mapping exercise, we produced poverty maps at the sub-county level (and parish for Kampala) using NPHC location-code system but did not produce poverty maps at the constituency level.

The update of the NPHC location-code system was not a simple task. First, frequent and unpredictable changes in the boundaries of administrative units posed a serious challenge to the exercise. In addition to the creation of new administrative structures such as districts, municipalities, town councils, sub-counties, and parishes, several rural areas were reclassified as town councils or municipalities. All such changes were meticulously incorporated into the final geography file.

Second, the location-code system for household survey data must be identical to the system for census data. In Uganda, UBOS drew a sample of the 2012/13 UNHS data from a sampling frame based on the 2002 NPHC. UBOS updated the location-code system for the 2012/13 UNHS to be

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[3] See UBOS (2013) for more details.

[4] More specifically, a constituency is in principle equivalent to a county (administratively) and EAs and Villages do not cross over administrative boundaries. Regarding the evolution of constituencies, these are largely curved out of counties and the changes have mainly occurred where new districts have been created and also lower administrative units. It is possible to trace the constituencies created and the original counties/constituencies they came from. This however, may take a while.

fully consistent with the new geography file. UBOS matched the geography file based on the 2002 NPHC with that of the 2014 NPHC, then matched the latter with the new geography file, incorporating all changes to administrative boundaries and classifications that occurred after the previous census enumeration. The result was a 15-digit hierarchical geocode representing various administrative level (Table 1).

Table 1: The 15-Digit Geocode

1st digit	Region
2nd and 3rd digit	Sub-Region
4th, 5th and 6th digit	District
7th digit	County
8th and 9th digit	Sub County
10th and 11th digit	Parish
12th and 13th digit	Village
14th and 15th digit	Enumeration Area

This geocode incorporates all changes to the geography file since the previous enumeration was completed. These include: (i) the addition of new districts, sub-counties, and other administrative units, (ii) changes in geographic relationships between districts, sub-counties, and smaller administrative areas; (iii) the consolidations of multiple administrative areas; (iv) changes in the status of certain areas as either part of, or independent from, the surrounding administrative area; and (v) changes in the boundaries of administrative units within districts.[5]

II.3.2. Regional Heterogeneity

Adjusting for regional variations in consumption is critical to the accuracy and statistical validity of the SAE approach.[6] The SAE methodology requires constructing a consumption model that is fixed for all households within a domain. This process assumes that the relationship between household spending and its proxies is the same for all households, implying that all remaining differences are due to errors rather than structural factors.[7] Thus, we introduce multiple models so that regression coefficients and error structures can adjust to the regional variations in consumption.

(S)sae, the World Bank's poverty-mapping STATA command, can incorporate two layers of errors (or residuals), which are typically at the levels of the household and one administrative unit. In addition to household-level errors, the consumption model presented here includes errors at the enumeration-area level. This does not mean, however, that there is no correlation of the errors at the district or sub-county levels. Ignoring large district- or sub-county-level correlations in

[5] Two enumeration areas covered in the UNHS could not be located in the census data and were not used to produce the poverty maps. The creation of new districts after the 2014 NPHC gave rise to town councils and municipalities, and some nearby communities were annexed into these newly created urban areas, and their names were changed. Consequently, not all merged enumeration areas could be identified.

[6] See more in Tarrozi and Deaton (2008).

[7] Admittedly, this is a strong assumption. Both Tarrozi and Deaton (2008) and Elbers et al. (2003) acknowledge that this can cause a bias in poverty estimation. Tarrozi and Deaton (2008) also warn that misspecification in error structure can cause a large bias in standard errors of the resulting poverty estimates.

household expenditures after controlling for observables can cause a substantial bias in the standard errors of poverty estimates. An obvious solution to this issue is to introduce multiple layers of errors during the consumption modeling. However, this is not currently possible, since sae currently allows for only two layers of errors. Thus, our strategy is to include variables at the district and sub-county levels in regression models so that correlations in errors at these levels are minimized by explicitly capturing them with observable variables. [8]

As there is no technique to fully eradicate these types of potential bias, the original analysis was complemented by a series of validation exercises, which provide empirical evidence to support the reliability of the derived disaggregated poverty estimates.

III. Constructing the 2017 Uganda Poverty Maps

Two key challenges emerged during the process of constructing the Uganda poverty maps: selecting a good consumption model and choosing an appropriate level of disaggregation. This section details the analytical methodology used to produce Uganda's 2017 poverty maps. The final models are listed in Table A-1 of Annex 1.

III.1. Model Selection

(a) The number of consumption models

As discussed above, to respond to differences in consumption patterns across regions, the 2017 Uganda poverty maps are based on five different consumption models, each of which corresponds to a stratum defined for the 2016/17 UNHS. The strata reflect differences across the four regions, and Uganda's capital city, Kampala, comprises its own stratum due to the unique nature of its consumption dynamics and economic characteristics. As noted above, inadequate adjustment to reflect regional differences in consumption patterns can cause a significant bias in the poverty estimates and corresponding standard errors produced by the SAE approach. For example, the educational attainment of a household head might be a stronger predictor of household wealth in urban Kampala than in the largely agricultural northern region. Applying the same model to the whole country may thus increase the risk of bias in poverty estimates and standard errors.

However, increasing the number of consumption models does not necessarily improve the statistical performance of poverty mapping. As the number of models increases, the sample size of the 2016/17 UNHS data for each model declines, reducing the accuracy and stability of each consumption model.

To balance the necessity of adjusting for regional heterogeneity with the corresponding reduction in sample size, five consumption models were created, one for each regions and Kampala. This approach is reasonable, as the sampling frame used for the 2016/17 UNHS also reflects regional variations across five strata.

(b) The fitness of consumption models by R-square and adjusted R-square

Both R-squared and adjusted R-square provide information on how well a consumption model can predict the actual consumption expenditures of each census household. R-square, or the coefficient

[8] See, e.g., World Bank, 2003; Zhao and Lanjouw, 2008; and Elbers et al., 2008.

of determination, represents the ratio of “explained variance” (i.e., the variance in household consumption expenditures predicted by the model) to the total variance of actual household expenditures. The higher the R-square, the better predicted expenditures fit actual expenditures. Adjusted R-square is modified to reflect the number of variables in the model. R-square always increases when a new variable is added to a model, but adjusted R-square increases only if the new variable improves the model more than would be expected by chance. The R-square and adjusted R-square for the models are both high across all regions – more than 42 percent (Table 2).

Table 2: The Distribution of R-square (R^2) and Adjusted R-square ($AdjR^2$) by Stratum

Stratum	Name	R^2	$AdjR^2$
1	Kampala	0.666	0.657
2	Central (excluding Kampala)	0.505	0.501
3	Eastern	0.449	0.446
4	Northern	0.538	0.534
5	Western	0.423	0.420

Source: Authors' calculations based on the 2016/17 UNHS and the 2014 NPHC

(c) The share of variance of residuals at the enumeration-area level

The consumption model cannot explain all variations in household expenditure. Unexplained variations are commonly associated with residuals, or simply errors, which have two layers in this analysis: enumeration area (EA) and household. EA-level residuals are included because the unexplained part of consumption expenditure can be affected by region-specific factors. Some of these factors are observable, while others may not be. The performance of poverty mapping is considered poor if the variance in EA-level errors constitutes more than 10 percent of the variance of total error. sae reports the EA-level variance as a proportion of the variance in total error. In this analysis, the proportion of EA-level error is less than 8.6 percent for all regions (Table 3).

Table 3: The Proportion of EA-level Error to Total Error

Stratum	Proportion
Central (excluding Kampala)	6.8%
Eastern	8.6%
Kampala	3.9%
Northern	6.6%
Western	3.6%

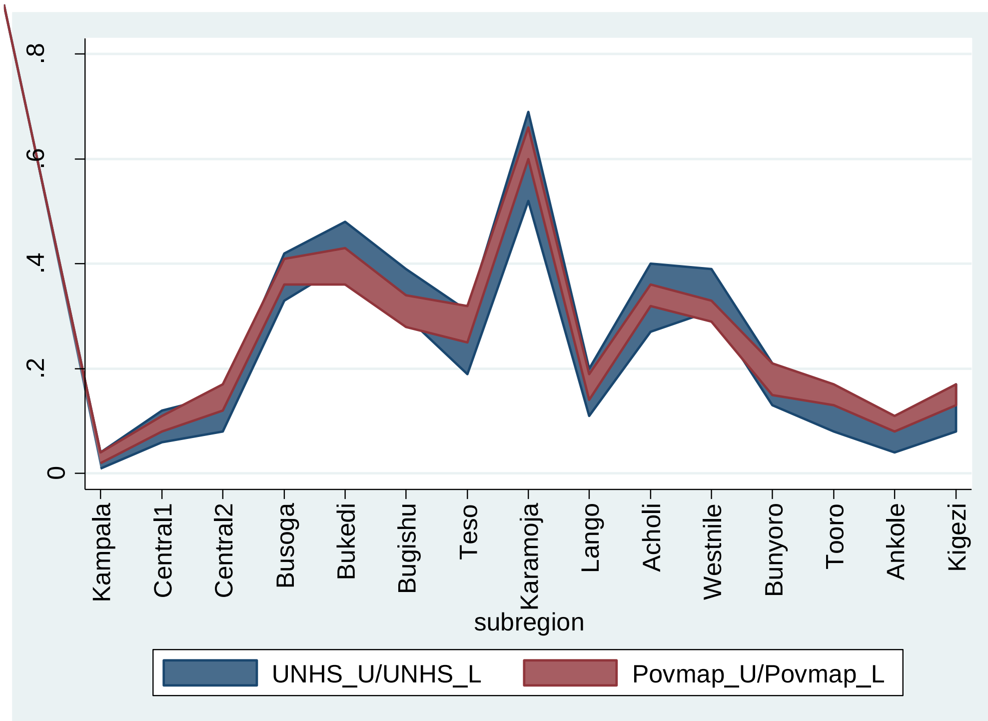
Source: Authors' calculations based on the 2016/17 UNHS and the 2014 NPHC

(f) Consistency in sub-regional poverty estimates between direct estimation based on 2016/17 UNHS data and the SAE method

The 2016/17 UNHS is stratified at the level of the 15 sub-regions, and a reasonable sample size is available for each stratum. Sub-regional poverty estimates based on household expenditure data from the 2016/17 UNHS are thus good predictors of true poverty incidence. The SAE method can also estimate poverty rates at the sub-region level, which should, in principle, predict the true level of poverty incidence. Consequently, the SAE estimates should be consistent with those derived from the household expenditure data in the 2016/17 UNHS.

This consistency check is conducted using the 95 percent confidence intervals of both estimates. Since the 2016/17 UNHS and the SAE method both produce poverty estimates, rather than true numbers, their 95 confidence intervals were constructed to illustrate margins of error—i.e., the extent to which their poverty estimates may be inaccurate. The two estimates are considered to be consistent if their 95 percent confidence intervals overlap. This consistency check shows that both estimates are consistent across all strata (Figure 1). Moreover, the poverty estimates produced by the SAE method for most sub-regions have substantially smaller 95 percent confidence intervals than the estimates based on the 2016/17 UNHS data. This indicates that the SAE method can yield more accurate poverty rates than direct estimates from the 2016/17 UNHS.

Figure 1: A Comparison between Sub-Regional Poverty Incidence Directly Estimated from the 2016/17 UNHS and Obtained through the SAE Method



Source: Authors' calculations based on the 2016/17 UNHS and the 2014 NPHC.

Note: red area illustrates the 95 percent confidence interval of SAE, while the blue that of the UNHS 16/17.

III.2. The Level of Disaggregation

The SAE method's margin of error tends to increase at lower administrative levels. Examining standard errors can identify the level of disaggregation where the level of precision of poverty estimates is acceptable. The analysis shows that the standard errors of poverty estimates at the sub-region, district, and even sub-county levels are relatively small (Table 4). For example, the largest standard error among all district estimates is just 5.7 percentage points. At the sub-county level, the standard errors are significantly higher than those at the district level, but except for the top 5 percent, the standard errors are less than 10 percent or so. Therefore, we decided to display poverty rates at the sub-county level except for Kampala. For Kampala, the standard errors at even the parish level are very low. The 95th percentile is 3.2 percent and only two observations out of 92 parishes in Kampala had more than 10 percent of standard error. We therefore decided to estimate the poverty map at the parish level for Kampala.

Table 4: Standard Errors at Various Administrative Levels

Percentile	**Standard Errors of Poverty Estimates (%)**			
	Sub region	District	Sub-county	Parish (Kampala only)
Median	1.2	1.5	2.4	0.7
95%	1.6	2.1	4.0	3.2
Max	1.6	2.7	10.4	13.9

Source: Authors' calculations based on the 2016/17 UNHS and the 2014 NPHC.

IV. Key Features of the 2016/17 Uganda Poverty Maps

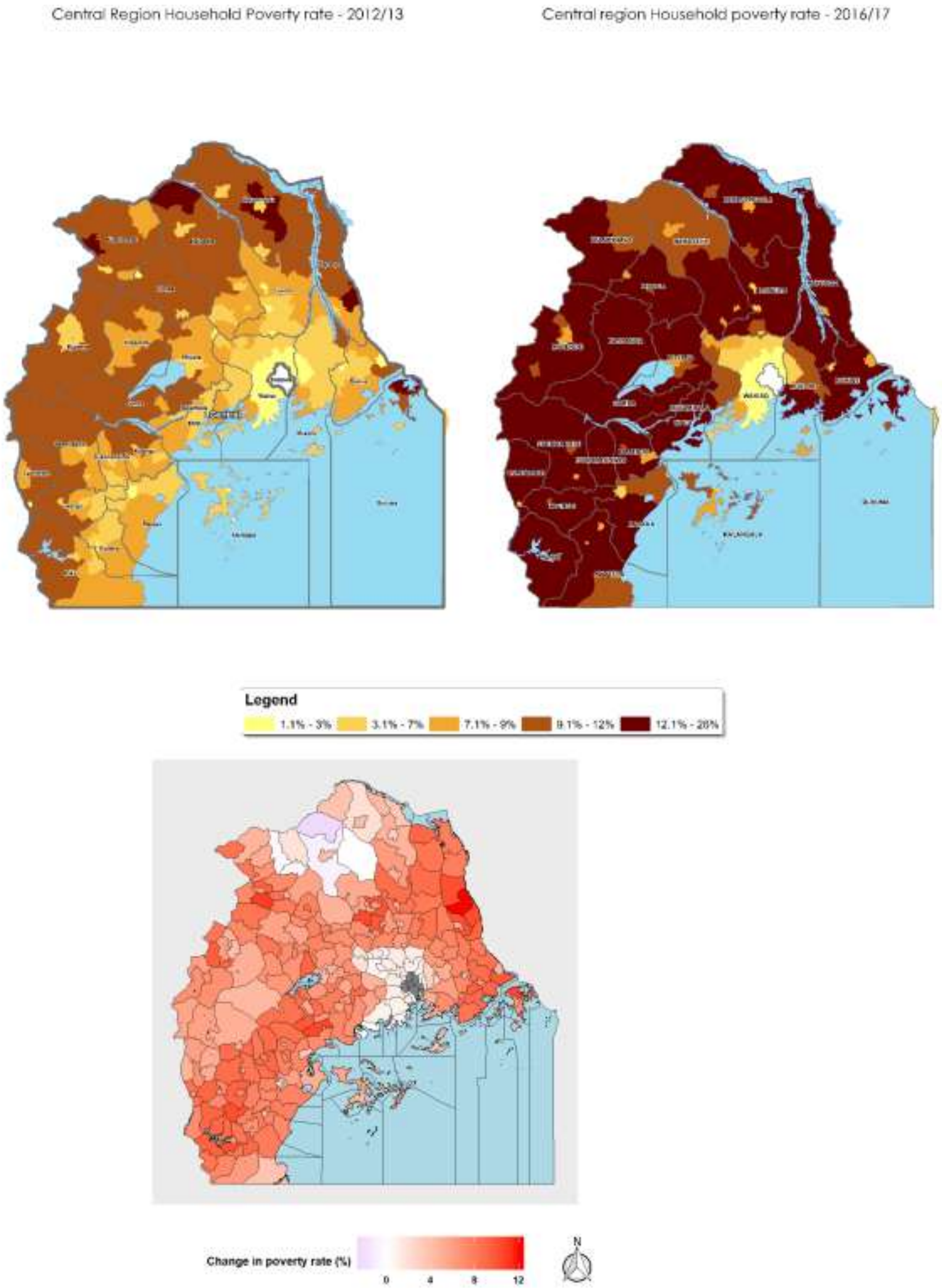
IV.1. The Value of Poverty Mapping

This section presents a new round of poverty mapping in Uganda. The methodology described above yields reliable indicators at multiple subnational administrative levels. Poverty maps offer the authorities and development partners a clear view of the evolving incidence of poverty across regions and localities. They also provide an opportunity for officials at multiple government levels to evaluate the effectiveness of the poverty-reduction policies implemented in their respective areas.

IV.2. The Incidence and Distribution of Poverty in the Central Region

Uganda's national poverty estimates mask wide variations across regions. According to the 2016/17 UNHS, 21.4 percent of the population is below the national poverty line and the poverty rate for the central region is 9.9 percent. Within the central region, the districts of Gomba, Kayunga, Kyankwanzi, and Rakai have continued to have the highest poverty incidence. For this new round, they are around 17 to 19 percent, which are still lower than the national average. Wakiso district, which includes Entebbe and much of suburban Kampala, has the region's lowest poverty rate at about 3 percent (Figure 2). However, compared with the 2012/13 poverty map, poverty in most sub counties increased significantly in 2016/2017.

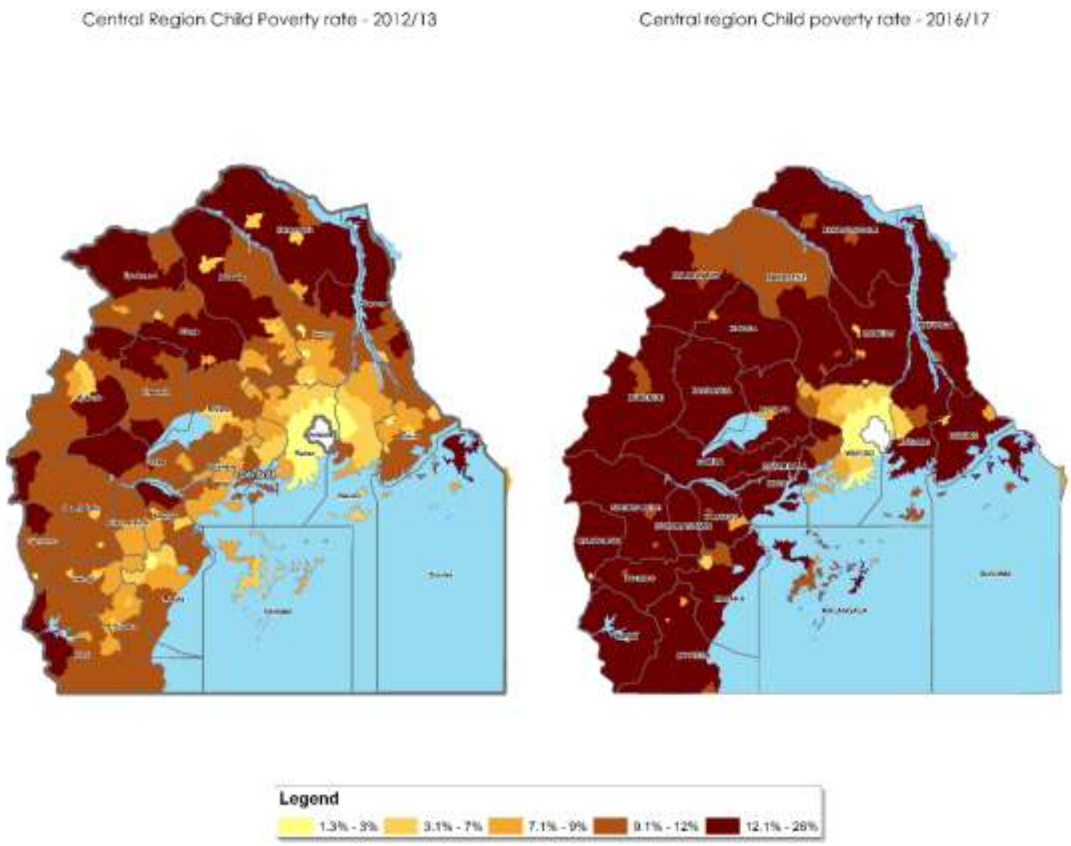
Figure 2: Poverty Incidence and Changes between 2012/13 and 2016/17 by Sub-County, Central Region

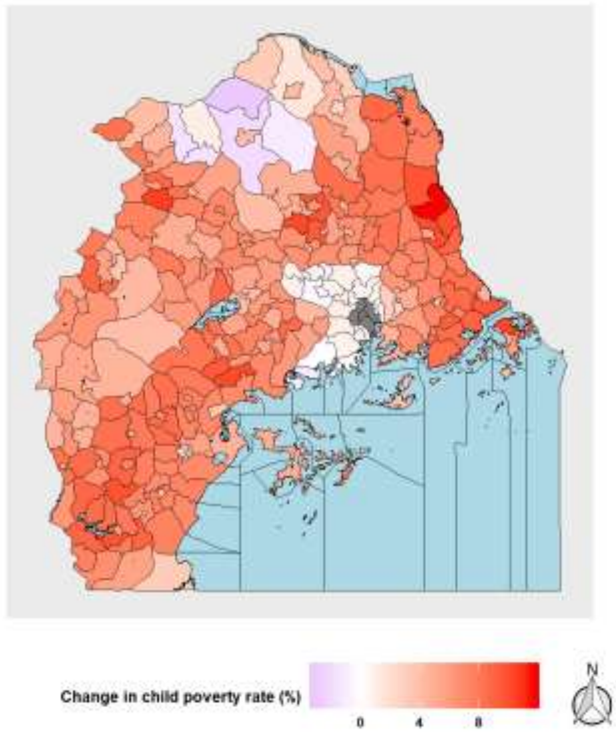


Source: Authors' calculations based on the 2012/13 and 2016/17 UNHS and the 2014 NPHC.

Poverty impacts demographic groups differently. Children are particularly vulnerable to the negative effects of poverty and related forms of deprivation associated with the welfare status of the households in which they reside. In the Central Region, the geographic distribution of child poverty is very similar to poverty for the whole population. Within the central region, the incidence of child poverty is high in the districts of Kyankwanzi, Kayunga, Buvuma, Gomba, and Rakai, where over 18 percent of children are below the poverty line. Also, child poverty rates increased largely in most sub counties. Wakiso district has the lowest rate of child poverty at 3 percent (Figure 3).

Figure 3: Child Poverty Incidence and Changes between 2012/13 and 2016/17 by Sub-County, Central Region





Source: Authors' calculations based on the 2012/13 and 2016/17 UNHS and the 2014 NPHC.

While poverty rates differ substantially by district, inequality is prevalent across all districts in the central region. The Gini coefficient is lowest in Buvuma and Kalangala districts at about 0.33 and the highest in Wakiso and Mukono districts at 0.44 or higher. Relatively low levels of income inequality are observed in districts with relatively high levels of income poverty, indicating that the low income levels of these districts are relatively uniform. However, more unequal districts experienced a large increase in Gini coefficient since the last poverty mapping exercise. For example, Wakiso district's Gini coefficient increased from 0.38 to 0.45 between 2012/13 and 2016. Overall, the ranking of districts by inequality level is the same for children and for the overall population. For example, the districts of Wakiso and Mukono have high levels of inequality among children and among the population as a whole.

At sub county level, the proportion of the population considered poor was highest in the sub-counties of Kitimbwa and Busana in Kayunga district and Busamizi in Buvuma district, all at 23 percent and lowest in most of the sub counties in Wakiso district as shown in Figure 3. On the other hand, child poverty rates are highest in Busamuzi sub county in Buvuma district and Kayonza, Busaana, and Kitimbwa in Kayunga district with over 23 percent of the children living in poverty and lowest at less than 2 percent in some of the sub counties of Wakiso district e.g. Division A and B in Entebbe, Namugongo Division in Kira Municipality (see Figure 3). Compared with the 2012, some subcounties in Kayunga, Gomba and Rakai experienced large increases in poverty rates.

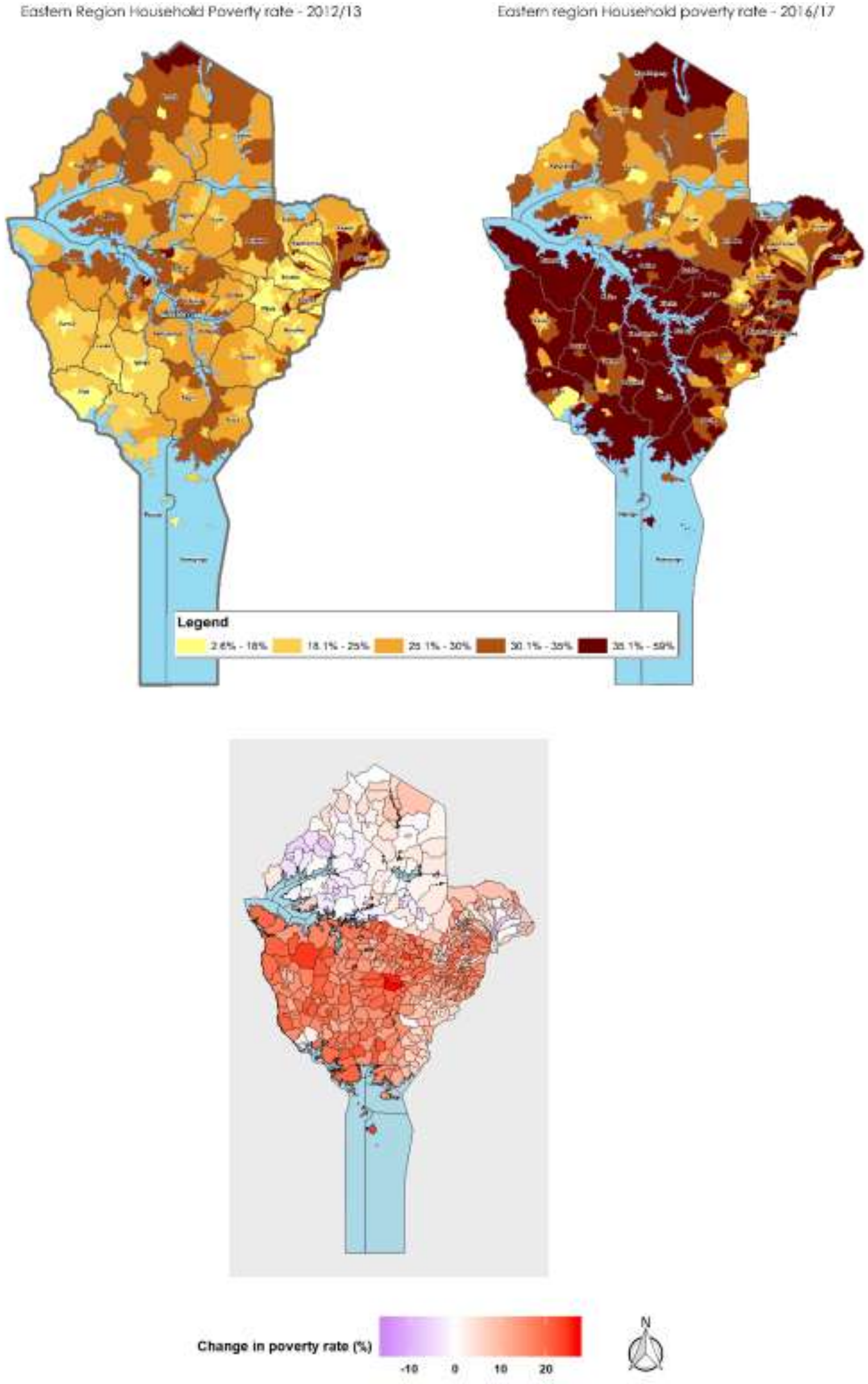
IV.3. The Incidence and Distribution of Poverty in the Eastern Region

At 35.7 percent, the overall poverty rate in the eastern region is significantly higher than the national rate (21.4 percent) and also now the highest in the country. The results further reveal that 38.2 percent of children in the eastern region live below the national poverty line. Poverty rates vary between districts, ranging from 23 percent in Jinja to 48 percent in Butaleja. Inequality also increased in the eastern region: Gini coefficients range from 0.29 in Manafwa to 0.43 in Jinja. At the district level, Butaleja district has the highest poverty rates both for children (51 percent) and the population as a whole (48 percent).

At the sub-county level, poverty rates vary widely between 2.6 percent and 55.4 percent. Nawanjofu in Butaleja district was the poorest sub-county, with a poverty rate of 55.4 percent, while Busaba sub-county in Butaleja District was the second-poorest at 55.1 percent (Figure 4). On the other hand, Western and Northern divisions of Soroti district and Central division of Jinja district have less than 5 percent of poverty rates.

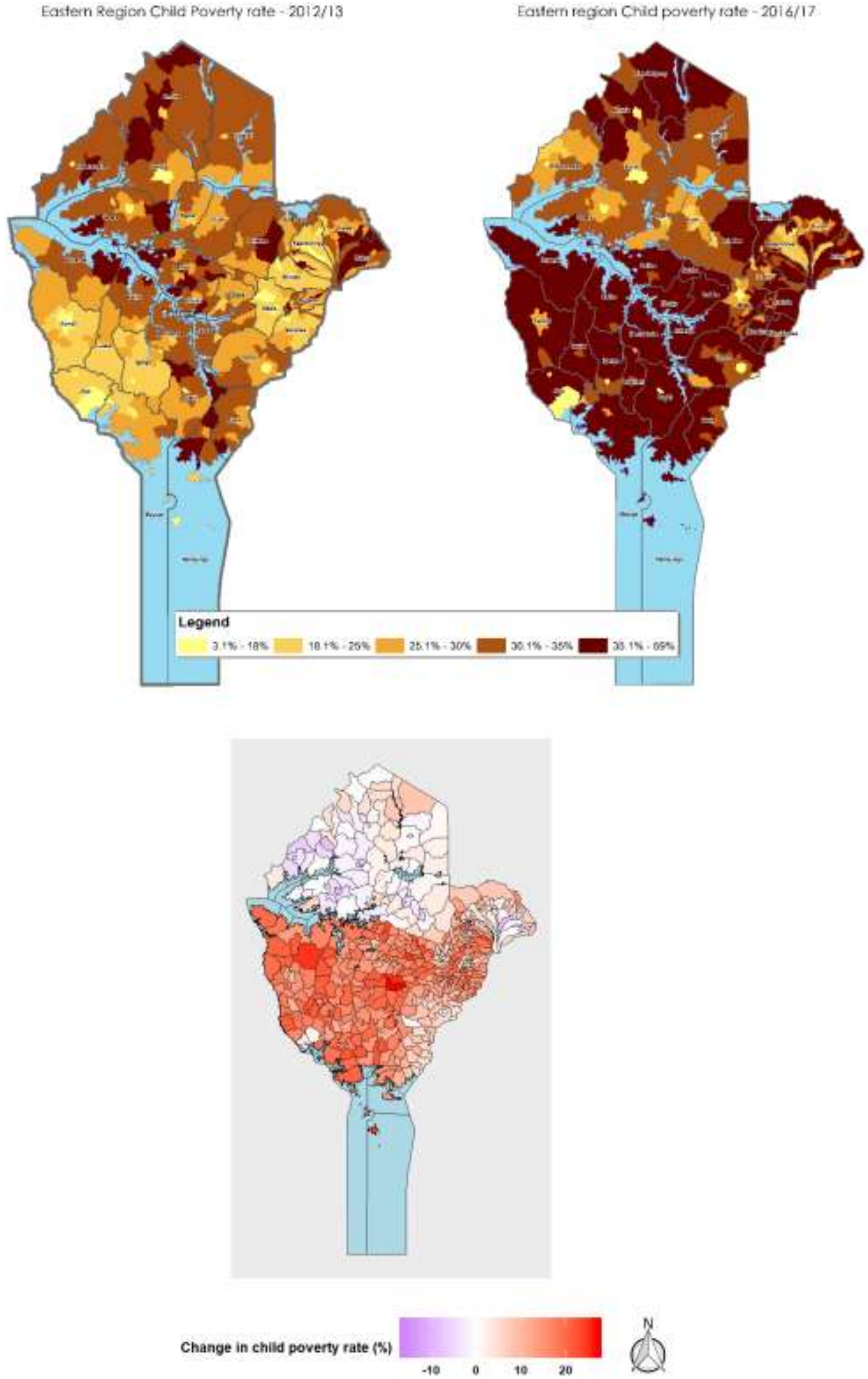
Compared with the 2012/13 poverty map, the poverty incidence of the southern part of the region worsened significantly. Child poverty also increased in a large area of the southern part of the region while it showed a significant improvement in some areas of the northern part of the region.

Figure 4: Poverty Incidence and Changes between 2012/13 and 2016/17 by Sub-County, Eastern Region



Source: Authors’ calculations based on the 2012/13 and 2016/17 UNHS and the 2014 NPHC.

Figure 5: Child Poverty Incidence and Changes between 2012/13 and 2016/17 by Sub-County, Eastern Region



Source: Authors' calculations based on the 2012/13 and 2016/17 UNHS and the 2014 NPHC.

IV.4. The Incidence and Distribution of Poverty in the Northern Region

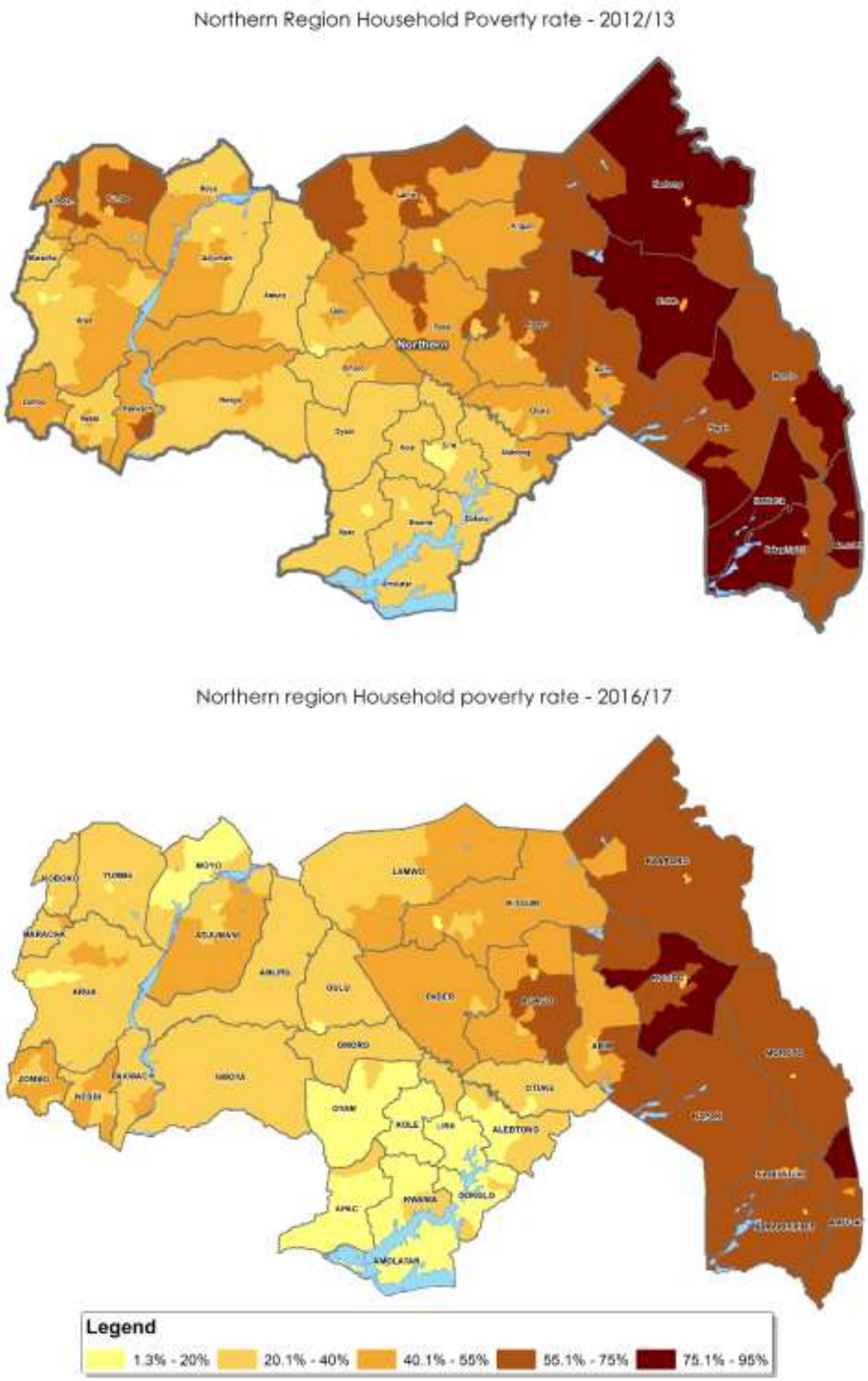
The incidence of poverty in northern region was the second highest region in 2016/17 with 32.5 percent of its population living below the national poverty line. It declined nearly 10 percentage points from 42 percent in 2012/13. An estimated 34.6 percent of children in the northern region live in households below the national poverty line. Inequality indicators are also very high. The Gini coefficient is 0.39 for both the entire population and children.

There are vast disparities in poverty incidence between districts, ranging from 12.0 percent in Lira District to 71.7 percent in Nabilatuk District. Inequality is also high and varied across districts. The Gini coefficients range from 0.33 in Dokolo District to 0.65 in Amuru District. Child poverty has a similar distribution.

All of the sub-counties with the highest poverty rates—ranging from 61 percent to 78 percent—are located in Karamoja (Figure 6). In Karamoja sub-region, 42 of the 64 sub counties have poverty rates above 60 percent. Loroo sub-county in Amudat district has the highest poverty incidence in the entire northern region, (78 percent), while Rengen sub county in Kotido district has the higher child poverty rate of 80 percent. (Figure 7).

Compared with the 2012/13 poverty map, poverty rates in the Karamoja sub-region declined significantly. For example, Kawalakol subcounty’s poverty headcount rate was 95 percent, the highest in 2012/13, but declined to 68 percent in 2016/17. Most sub counties experienced similar reductions in poverty headcount rates both of the whole population and among children.

Figure 6: Poverty Incidence and Changes between 2012/13 and 2016/17 by Sub-County, Northern Region



Source: Authors' calculations based on the 2012/13 and 2016/17 UNHS and the 2014 NPHC.

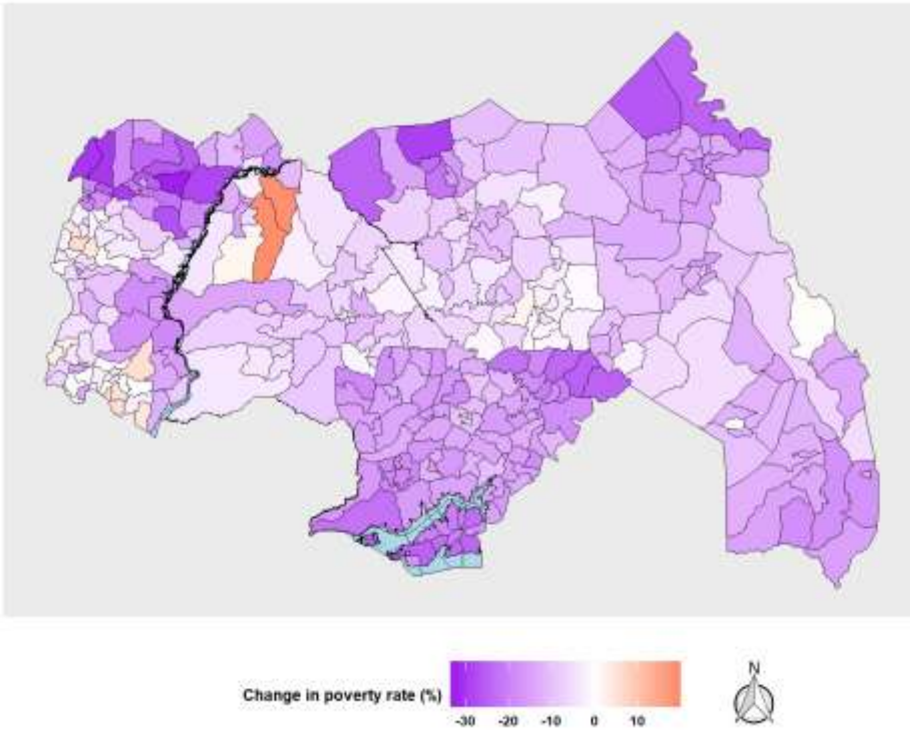
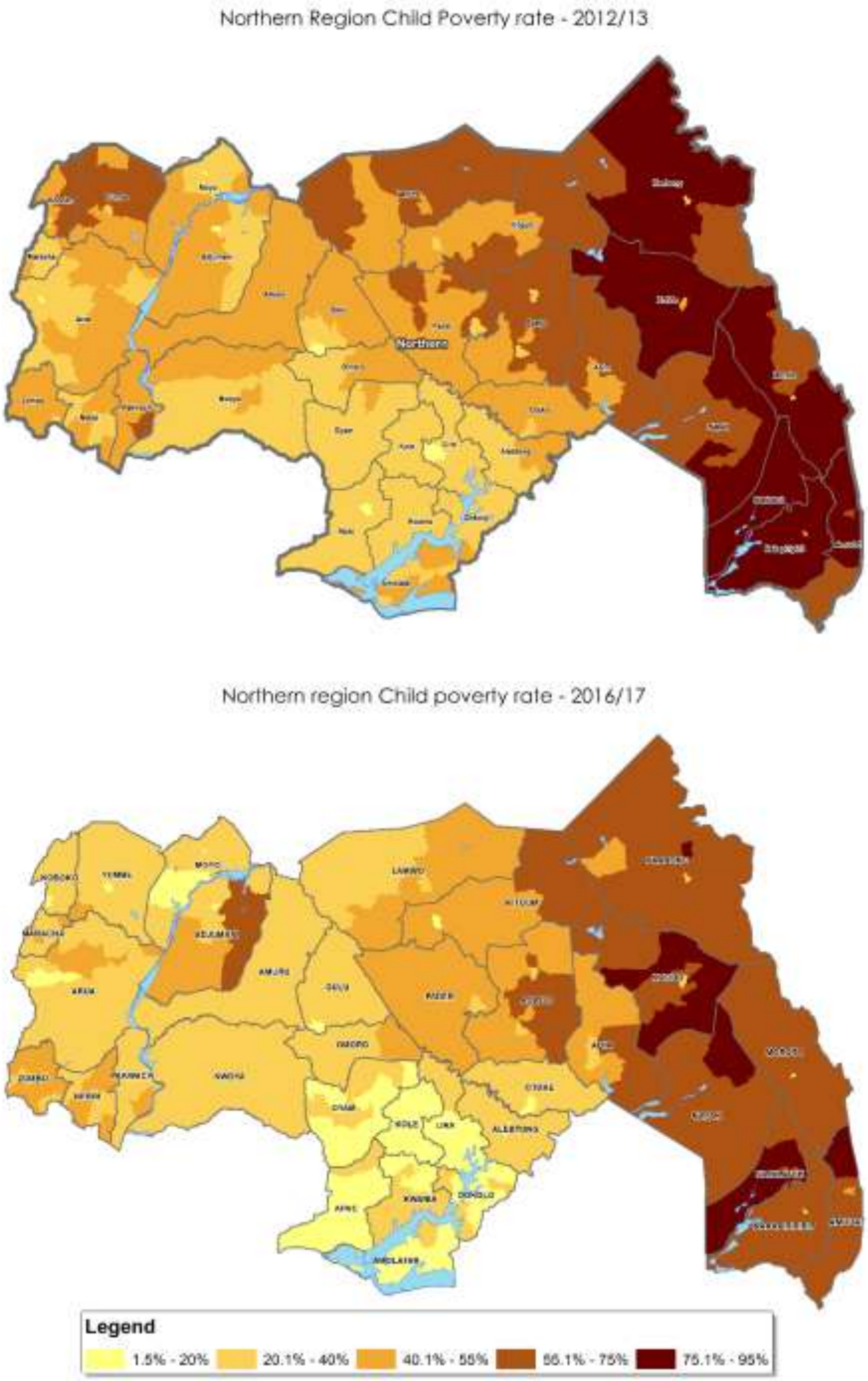
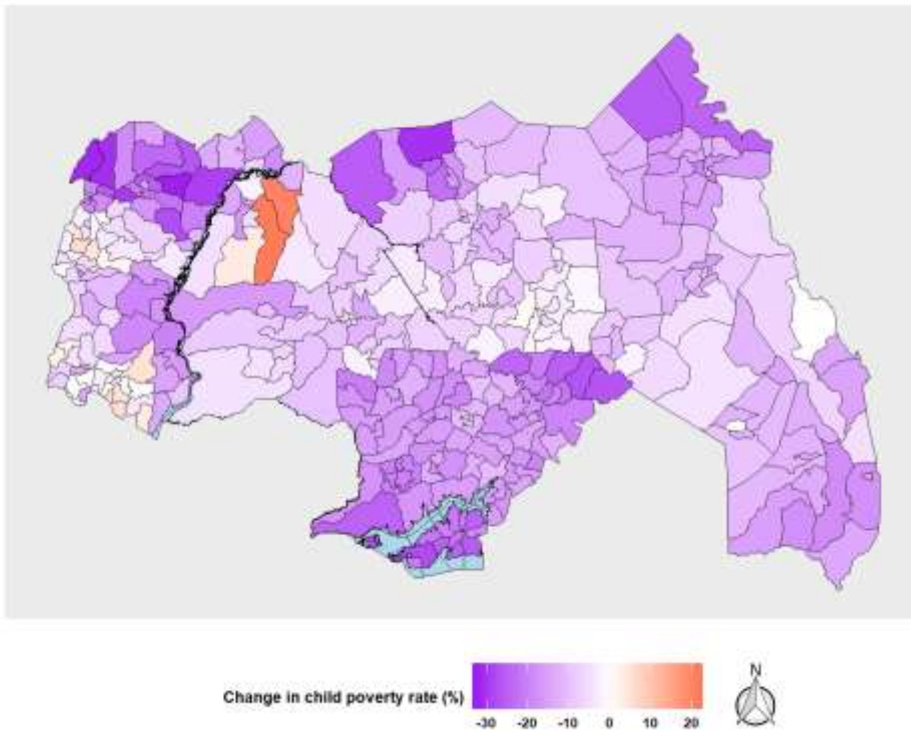

Change in poverty rate (%)
-30
-20
-10
0
10
N

Figure 7: Child Poverty Incidence and Changes between 2012/13 and 2016/17 by Sub-County, Northern Region





Source: Authors' calculations based on the 2012/13 and 2016/17 UNHS and the 2014 NPHC.

Generally, towns and municipalities tend to have a lower incidence of poverty in the northern region except for the Karamoja sub-region. The region's lowest poverty rate is in Lira district's Ojwina Division at just 1 percent. Agago Town Council has the highest poverty rate among towns and municipalities outside the Karamoja subregion at 45.9 percent. Within the Karamoja subregion, even some municipalities (e.g., North, West and South Divisions of Kotido municipality) have more than 70 percent of poverty rates. Child poverty rates in towns and municipalities in Northern Region also have a similar distribution, ranging from 2 percent in Lira's Ojwina Division to 75 percent in Kotido's South Division.

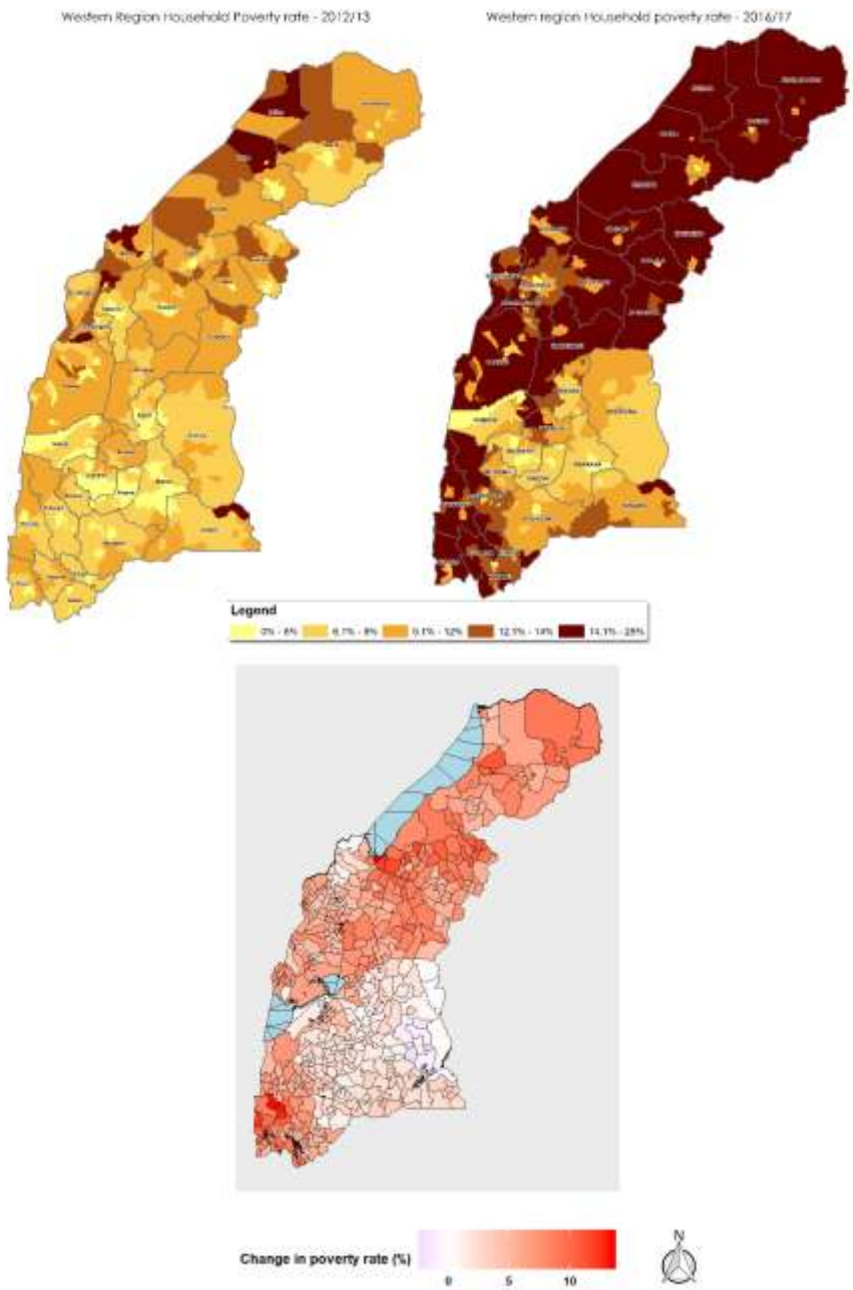
IV.5. The Incidence and Distribution of Poverty in the Western Region

At just 11.4 percent, the incidence of monetary poverty in western Uganda is almost half the national average. The poverty rate among children is also as low as 12.2 percent. However, inequality is substantial; the region's Gini coefficient is 0.33 for the general population and 0.39 for children.

All 32 districts have poverty rates below the national poverty rate of 21.4 percent. But in general, poverty rates, either for the general population or the child population, increased. For example, in 2012/13, only 13 districts have poverty rates for the general population over 10 percent while in 2016/17, 26 districts have poverty rates over 10 percent. Buliisa district has the region's highest poverty rates: 21 percent for the total population in 2016/17, increasing from 14 percent in 2012/13 and Mbarara district had the lowest (7 percent). Geographically speaking, the incidence of poverty increased largely in the northern part of the Western region. In 2016/17, Gini coefficients are high at over 0.3 in all 32 districts, both for the total population and the child population, revealing large disparities in household consumption within each district.

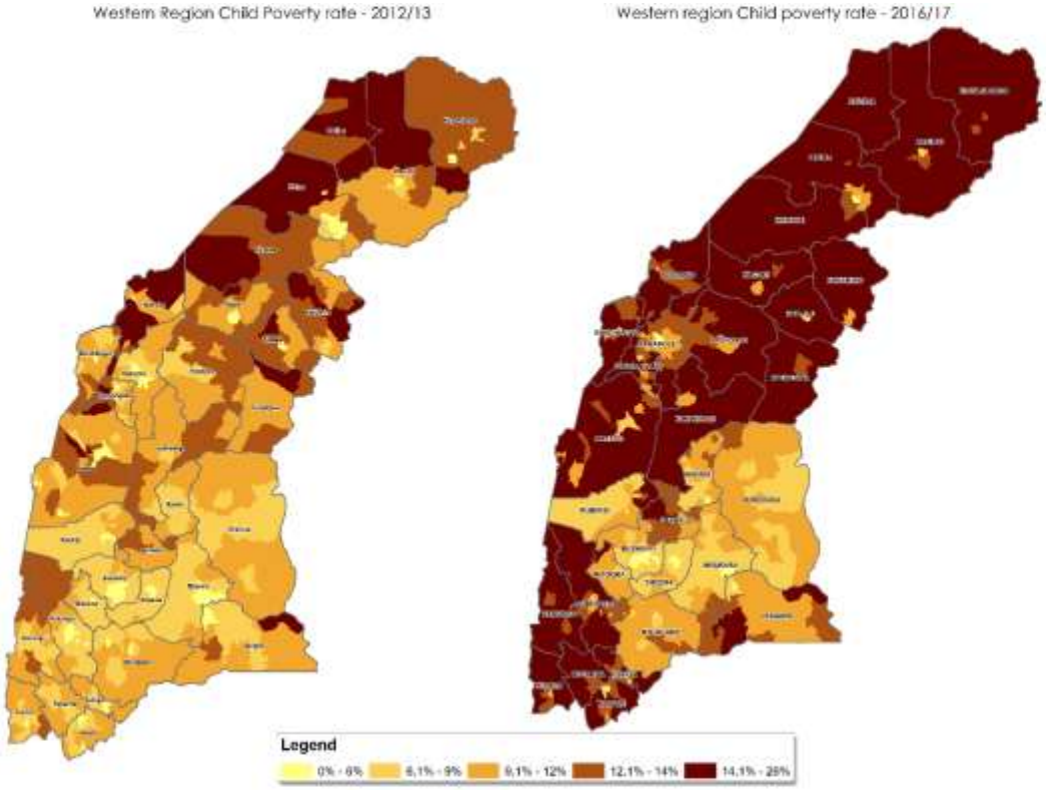
Mpungu sub-county in Kanungu District has the highest poverty rate in the Western region, which is 24.7 percent for the general population and 25.9 percent for the child population. Buliisa district includes three of the region's six poorest sub-counties (Figure 8). Poverty rates among children are higher than the rates for the general population. While 337 sub-counties have total poverty rates over 10 percent, 358 sub-counties have child poverty rates over 10 percent (Figure 9).

Figure 8: Poverty Rates and Changes between 2016/17 by Sub-County, Western Region

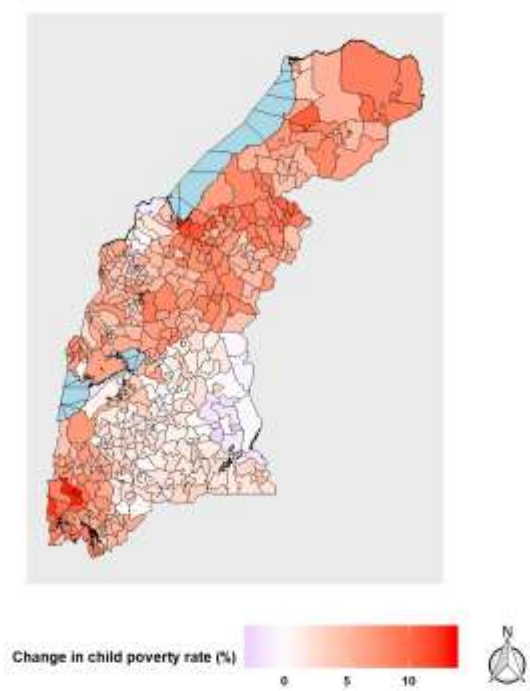


Source: Authors' calculations based on the 2012/13 and 2016/17 UNHS and the 2014 NPHC.

Figure 9: Child Poverty Rates by Sub-County, Western Region



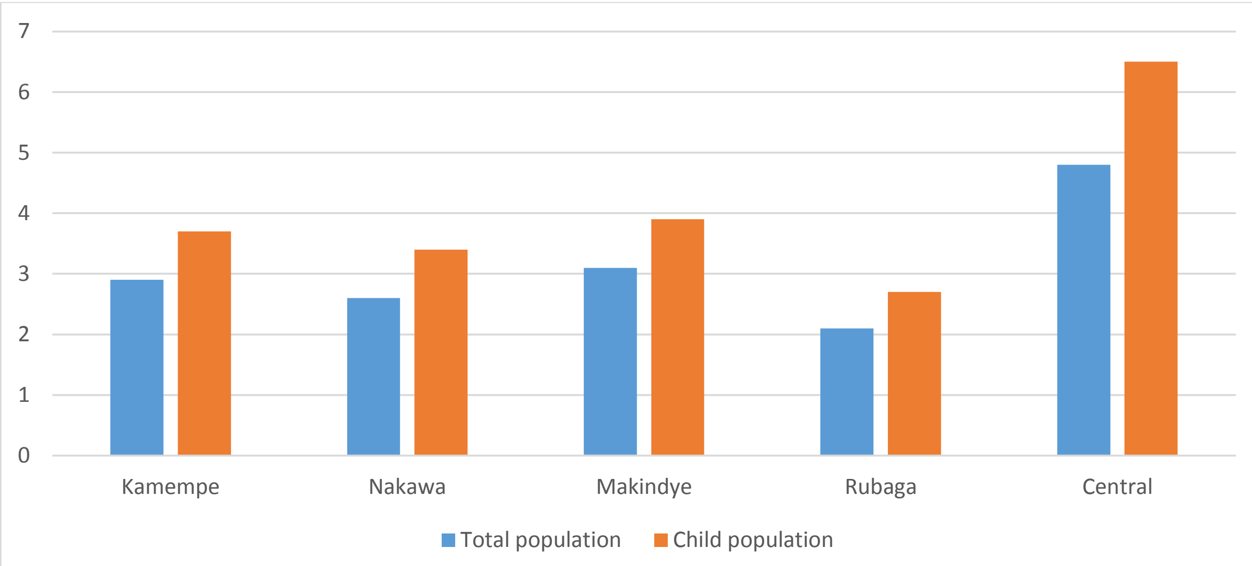
Source: Authors' calculations based on the 2012/13 and 2016/17 UNHS and the 2014 NPHC.



IV.6. The Incidence and Distribution of Poverty in Kampala District

Kampala has the lowest poverty rates in the country. Just 2.6 percent of the total population and the child population live below the national poverty line. Poverty rates do not change much between divisions but are consistently higher among children than among the population as a whole (Figure 10). Central Division has the highest poverty rates for both the total population (4.8 percent) and among children (6.5 percent). Rubaga Division has the lowest poverty rates for both the total population (2.1 percent) and the child population (2.7 percent). Kampala's high Gini coefficients also reveal significant disparities in household consumption.

Figure 10: Poverty Rates by Division, Kampala

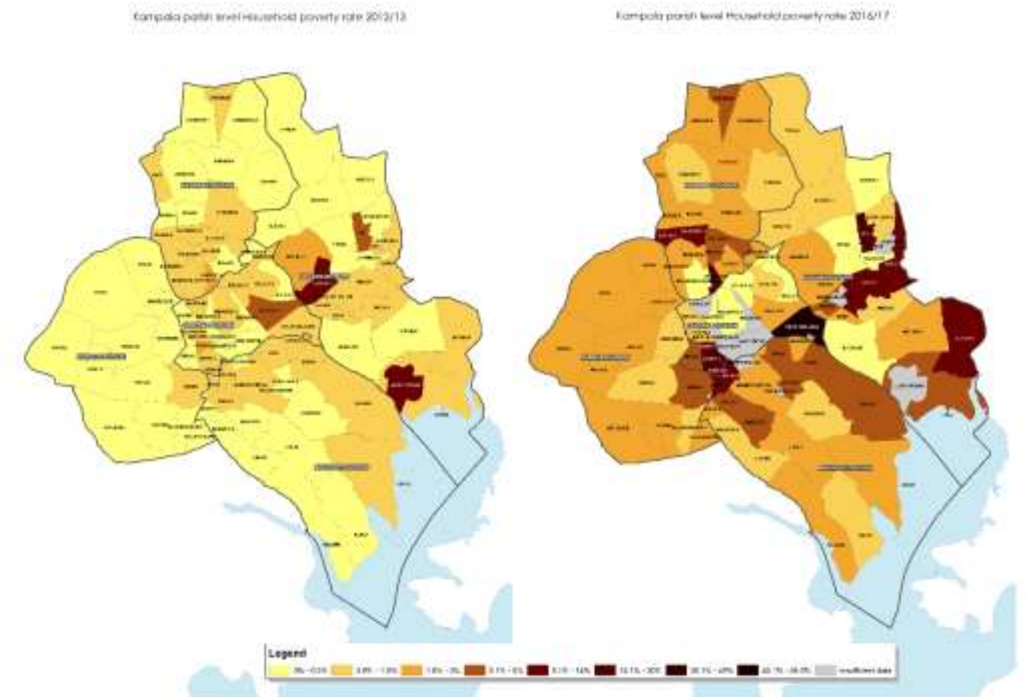


Source: Authors' calculations based on the 2012/13 UNHS and the 2014 NPHC.

At the parish level, some parishes have very high poverty rates. More than 56 percent of the whole population and 62 percent of children in Parish (10110210103) of Central Division are poor. Such high incidence of poverty did not exist in 2012/13. Two more parishes have more than 25 percent of the whole population who are poor. The rest (89 parishes) has a poverty rate lower than the national average and 79 parishes have less than 5 percent of poverty rate. Inequality is in general high. All parishes have the Gini coefficient higher than 0.34. 80 parishes have the Gini coefficient higher than 0.4 and 17 parishes have the Gini coefficient higher than 0.5.

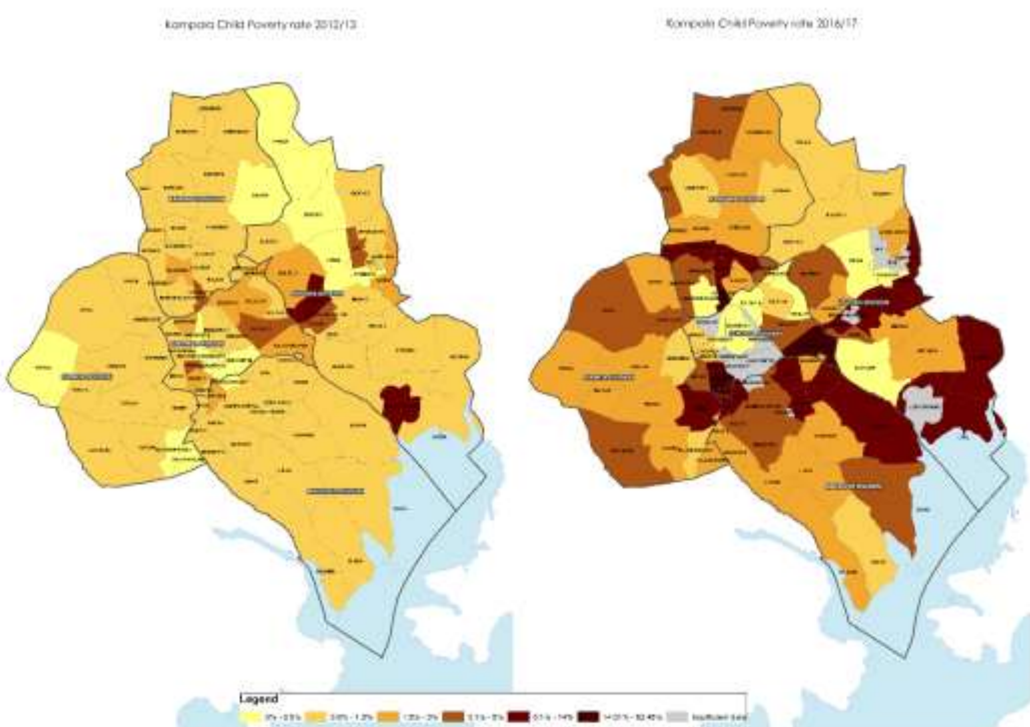
As in the other regions of Uganda, child poverty levels in Kampala are significantly higher than those of the general population across all administrative levels. Around 30 percent of parishes in Kampala have total poverty rates over 3 percent while around 45 percent of parishes have child poverty rates over 3 percent (Figure 11 and Figure 12).

Figure 11: Poverty Rates by Parish, Kampala



Source: Authors' calculations based on the 2012/13 and 2016/17 UNHS and the 2014 NPHC.

Figure 12: Child Poverty Rates by Parish, Kampala



Source: Authors' calculations based on the 2012/13 and 2016/17 UNHS and the 2014 NPHC.

V. Conclusion and Next Steps

This report has presented the results of a Uganda poverty-mapping exercise conducted by UBOS, UNICEF, and the World Bank. The updated poverty maps shown above are based on data from the 2014 NPHC and the 2016/17 UNHS. They follow the methodology used for producing the 2012/13 poverty maps to maintain comparability of poverty rates between two maps. While frequent and unpredictable changes in the boundaries of administrative units, the creation of new administrative levels, and the reclassification of individual areas all posed significant methodological challenges, the results are robust.

Like the previous poverty mapping exercise, the World Bank and UNICEF worked closely with UBOS counterparts to facilitate the transfer of knowledge and skills. Several training workshops were held for UBOS staff, as well as an educational visit to Washington DC, to ensure that UBOS has access to the technical proficiency necessary to update Uganda's poverty maps moving forward.

Validation exercises show that the statistics predicted by the SAE poverty-mapping technique are robust, and that poverty and inequality estimates remain reasonably precise up to the sub-county level. Both R-square and adjusted R-square are high for all models. For most sub-regions, the 95 percent confidence intervals for poverty estimates produced by the SAE method are substantially smaller than those of estimates based on the 2012/13 UNHS data. This indicates that the SAE method can produce more precise poverty statistics than those estimated from household surveys.

Compared with the 2012/13 map, the incidence of poverty increased significantly in the Central, Eastern, and Western regions while it declined notably in most areas of the Northern region, especially in the Karamoja subregion. Within the Central region, some subcounties in Kayunga, Gomba and Rakai districts experienced large increases in poverty rates. Within the Eastern region, the southern part of the region experienced large increases in poverty rates while within the Western region, it was the northern part of the region that experienced a rise in poverty.

Inequality within sub-counties is high in richer regions like the Central and Western regions. Poverty rates vary largely across sub-counties in the Northern and Eastern regions. Similarly, poverty rates in richer areas in these regions are less than 5 percent while those in poorer areas in these regions are higher than 50 percent.

Like the 2012/13 map, the incidence of poverty is higher among children than in the general population. This is a reflection of the fact that poor households have more children than the non-poor.

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Table A-1: Final Models with the GLS coefficients

Kampala (Obs 793; Root MSE 0.417; EB - Bootstrap)

	Coefficient	Std. Err.	t	|Prob|>t
Intercept	12.2656	0.1281	95.7300	0.0000
bathroom_1	0.1889	0.0589	3.2100	0.0010
bathroom_6	-0.2185	0.1065	-2.0500	0.0400
floor_1_pc	-4.4483	1.0334	-4.3000	0.0000
head_marst~5	-0.1436	0.0689	-2.0800	0.0370
hsize	-0.3427	0.0279	-12.3000	0.0000
hsize_sq	0.0198	0.0027	7.2500	0.0000
kitchen_1	0.3163	0.0640	4.9400	0.0000
kitchen_3	0.2515	0.0518	4.8600	0.0000
kitchen_3_pc	-1.0560	0.3742	-2.8200	0.0050
mean_csch	0.6254	0.0793	7.8800	0.0000
mean_educ~l2	-0.1586	0.0688	-2.3100	0.0210
mean_schage	-0.1619	0.0609	-2.6600	0.0080
ncomputer	0.1940	0.0373	5.2000	0.0000
nmotorcycle	0.2697	0.0756	3.5700	0.0000
nmotorvehi~e	0.3950	0.0470	8.4000	0.0000
ntelevision	0.2808	0.0364	7.7100	0.0000
rooms_3_pc	3.1810	0.6444	4.9400	0.0000
sum_educlvl1	-0.0882	0.0285	-3.1000	0.0020
sum_educlvl7	0.1626	0.0401	4.0600	0.0000
toilet_3_pc	1.5336	0.4635	3.3100	0.0010
waterdrink~1	0.2289	0.0592	3.8700	0.0000

Central Region (Excluding Kampala) (Obs 2901; Root MSE 0.494; EB Bootstrap)

	Coefficient	Std. Err.	t	|Prob|>t
Intercept	11.627	0.077	150.300	0.000
bathroom_1	0.164	0.054	3.020	0.003
dist_12	0.149	0.042	3.570	0.000
energysource_1	0.338	0.039	8.680	0.000
energysource_2	0.190	0.036	5.240	0.000
energysource_5	0.118	0.040	2.920	0.004
head_age	-0.007	0.001	-7.520	0.000
head_educlvl6	0.170	0.058	2.930	0.003
head_literacy	0.124	0.036	3.420	0.001
head_marstat_2	-0.107	0.030	-3.540	0.000
head_sex	-0.080	0.033	-2.400	0.016
kitchen_1	0.175	0.053	3.310	0.001
kitchen_2	0.155	0.063	2.460	0.014
mean_child5	-0.706	0.083	-8.470	0.000

mean_educlvl4	0.175	0.051	3.470	0.001
mean_educlvl8	0.315	0.089	3.530	0.000
mean_schage	-0.344	0.046	-7.450	0.000
ncomputer	0.225	0.055	4.110	0.000
nmotorcycle	0.202	0.036	5.610	0.000
nmotorvehicle	0.389	0.059	6.640	0.000
shoes	0.247	0.031	7.930	0.000
sum_prmsch	0.163	0.038	4.260	0.000
toilet_1	0.240	0.083	2.900	0.004
toilet_3	-0.152	0.029	-5.190	0.000
waterdrinking_2	-0.070	0.029	-2.390	0.017

Eastern Region (Obs 3986; Root MSE 0.453; EB Bootstrap)

	Coefficient	Std. Err.	t	|Prob|>t
Intercept	10.9667	0.0481	227.9600	0.0000
clothing	0.0960	0.0266	3.6100	0.0000
energycooking_3	0.1621	0.0330	4.9200	0.0000
energysource_2	0.1460	0.0310	4.7000	0.0000
energysource_3	0.1169	0.0407	2.8800	0.0040
head_marstat_2	-0.0948	0.0211	-4.5000	0.0000
mean_child5	-0.1817	0.0601	-3.0300	0.0020
mean_econactv_3	-0.4087	0.1082	-3.7800	0.0000
mean_educlvl4	0.1973	0.0533	3.7000	0.0000
mean_educlvl5	0.3409	0.0680	5.0100	0.0000
mean_educlvl6	0.2778	0.1173	2.3700	0.0180
mean_educlvl7	0.6158	0.0803	7.6700	0.0000
ncomputer_pc	1.2919	0.4016	3.2200	0.0010
nmotorcycle	0.1732	0.0577	3.0000	0.0030
nmotorvehicle	0.8119	0.0837	9.7000	0.0000
nradio	0.0756	0.0187	4.0500	0.0000
shoes	0.2425	0.0237	10.2400	0.0000
subreg_1	-0.2430	0.0412	-5.9000	0.0000
subreg_2	-0.1843	0.0436	-4.2300	0.0000
subreg_3	-0.2030	0.0445	-4.5600	0.0000
sum_age1t14	-0.0510	0.0053	-9.6600	0.0000
tenure_4_pc	-6.0218	2.0117	-2.9900	0.0030
toilet_2	0.1461	0.0260	5.6200	0.0000
waterdrinking_1	0.1814	0.0379	4.7800	0.0000

Northern Region (Obs 3385; Root MSE 0.473; EB Bootstrap)

	Coefficient	Std. Err.	t	|Prob|>t

Intercept	11.4109	0.1245	91.6500	0.0000
bathroom_3	0.0663	0.0284	2.3400	0.0200
clothing	0.1015	0.0342	2.9600	0.0030
energycooking_1	0.6208	0.1339	4.6400	0.0000
energysource_3_pc	-0.2413	0.1105	-2.1800	0.0290
energysource_4_pc	-0.1972	0.0598	-3.2900	0.0010
head_econactv_4	-0.2612	0.0624	-4.1900	0.0000
mean_depratio	-0.3851	0.0538	-7.1500	0.0000
mean_econactv_4	0.1857	0.0711	2.6100	0.0090
mean_educlvl1	-0.2637	0.0508	-5.1900	0.0000
mean_educlvl4	0.2968	0.0676	4.3900	0.0000
mean_educlvl5	0.2031	0.0859	2.3700	0.0180
mean_elder	0.5962	0.1301	4.5800	0.0000
mean_schage	-0.3414	0.0454	-7.5300	0.0000
nbicycle	0.0756	0.0184	4.1000	0.0000
ngenerator_pc	-0.3132	0.0928	-3.3800	0.0010
nmotorcycle	0.2924	0.0415	7.0500	0.0000
nmotorcycle_pc	1.4230	0.2942	4.8400	0.0000
nmotorvehicle	0.4144	0.0550	7.5300	0.0000
nradio	0.1177	0.0196	6.0100	0.0000
ntelevision	0.1986	0.0532	3.7300	0.0000
shoes	0.2667	0.0254	10.5200	0.0000
subreg_2	0.2695	0.0308	8.7500	0.0000
sum_child5_pc	-0.2524	0.0835	-3.0200	0.0020
toilet_4	-0.0955	0.0325	-2.9400	0.0030
waterdrinking_1	0.1732	0.0438	3.9500	0.0000
waterdrinking_2_pc	-0.1657	0.0588	-2.8200	0.0050

Western Region (Obs 3586; Root MSE 0.516; EB Bootstrap)

	Coefficient	Std. Err.	t	|Prob|>t
Intercept	11.6714	0.0714	163.5200	0.0000
bathroom_3	0.1048	0.0486	2.1600	0.0310
energycooking_1	0.3143	0.1352	2.3200	0.0200
energysource_4	-0.1010	0.0252	-4.0100	0.0000
energysource_4_pc	-0.3239	0.0805	-4.0200	0.0000
head_sex	-0.1037	0.0283	-3.6600	0.0000
mean_child5	-0.3704	0.0784	-4.7300	0.0000
mean_csch	0.2979	0.0617	4.8300	0.0000
mean_educlvl1	-0.2261	0.0464	-4.8800	0.0000
mean_educlvl5	0.3222	0.0773	4.1700	0.0000
mean_educlvl7	0.4138	0.0914	4.5300	0.0000
mean_schage	-0.3123	0.0542	-5.7600	0.0000

nbicycle	0.0966	0.0281	3.4400	0.0010
nmotorcycle	0.2490	0.0382	6.5200	0.0000
nmotorvehicle	0.4543	0.0418	10.8700	0.0000
nradio	0.1261	0.0192	6.5800	0.0000
ntelevision	0.2732	0.0420	6.5100	0.0000
shoes	0.1843	0.0254	7.2600	0.0000
subreg_2	0.0885	0.0288	3.0700	0.0020
subreg_3	0.1785	0.0312	5.7200	0.0000
sum_age0t6	-0.0619	0.0083	-7.5000	0.0000
sum_age25t64	-0.0495	0.0155	-3.2000	0.0010
waterdrinking_1	0.1108	0.0315	3.5200	0.0000

Table A-2: Definition of Variables

bathroom	1= inside w/ drainage provided 3= outside w/ drainage 6= none
clothing	
dist	
energycooking	1= electricity-national grid 3= electricity-personal generator
energysource	1= electricity-national grid 2= electricity-solar 3= electricity-personal generator 3_pc=XXX 4= electricity-community plant 4pc_= XXX 5= gas/biogas/LPG
floor	1= iron sheets 1_pc= XXXX
head	
head_age	
head_econactv_4	
head_educlvl6	
head_literacy	
head_marst	~5
head_marstat	_2
head_sex	
hsize	
kitchen	1= inside, specific room 2= inside, no specific room 3= outside, built 3_pc=XXXX
mean_child5	
mean_csch	
mean_depratio	

mean_econactv	
mean_educ	
mean_elder	
mean_schage	
nbicycle	
ncomputer	
ngenerator	
nmotorcycle	
nmotorvehi	
nmotorvehicle	
nradio	
ntelevision	
rooms	1= 1 room 2= 2 rooms 3= 3 rooms 4= 4 rooms 5= 5 rooms 6= 6 rooms 7= 7 rooms 8= 8 rooms 9= 9 or more rooms
shoes	
subreg	1=XXXX 2= XXXX 3=XXXX
sum_age0t6	
sum_age1t14	
sum_age25t64	
sum_child5_pc	
sum_educlvl1	
sum_educlvl7	
sum_prmsch	
tenure	4= subsidized public 4pc= XXXX
toilet	1= flush toilet 2= VIP latrine 3= covered pit latrine w/ slab 3_pc=XXXX 4= covered pit latrine w/o slab
waterdrink, waterdrinking	1= piped water into dwelling 2= piped water to the yeard 2_pc=XXXX
bathroom	1= inside with drainage provided 2= inside without drainage 3= outside with drainage 4= outside without drainage 5= make shift 6= none 7= other
clothing	*Whether the household have clothing or not*
dist	*(Not sure) What is the distance to this source of water? Or District Code*
energycooking	1= clean fuel 2=Paraffin 3= Charcoal 4= Others
energysource	1= Electricity-National grid 2=Electricity- Solar 3= Parafin/ lantern 3_pc=XXX 4= Candle/Tadooba 4_pc= XXX 5= Others
floor	1_pc= XXXX

head_	*Features of household head*
age	Age in completed years
econactv	1= Working for pay 2= Self employed 3= looking for work 4= Not working
educlvl	1= grade is lower or equal to 4 or grade 10 2= grade 11 to 16 3= grade 17 4= grade 31 to 33 and 21 5= grade 34 6= grade35 to 36 7= grade 41 (prof certificate) and42 (diploma) 8= grade 43 to 47 (first degree, post grad certificate, post grad diploma, masters, PhD)
literacy	*Can the person read and write*
marst(at)	1= married (monogamous) 2= married (polygamous) 3= divorced/separated 4= widowed 5= never married
sex	
hsize	Household size
_sq	squared
kitchen	1= inside, specific room 2= inside, no specific room 3= outside, built 3_pc=XXXX 4= makeshift 5= open space
mean_	*Ratio of applicable number of people in the household*
child5	Children age younger than 5 years old
csch	Currently attending school
depratio	Age younger than 14 or age elder than 64 and missing value
econactv	See above
educlvl	See educlvl above
elder	Age 60+ years old
schage	Age 6 to 25 years old
nbicycle	How many bicycles does the household own
ncomputer	How many computers does the household own pc_= XXXX
ngenerator	How many generators does the household own pc_= XXXX
nmotorcycle	How many motorcycles does the household own pc_= XXXX
nmotorvehi(cle)	How many multivehicle does the household own
nradio	How many radios does the household own
ntelevision	How many televisions does the household own
rooms	1= 1 room 2= 2 rooms 3= 3 rooms 3_pc= XXXX 4= 4 rooms 5= 5 rooms +
shoes	*Whether the household have shoes or not*
subreg	1=XXXX 2= XXXX 3=XXXX
sum_	*How many applicable people the household has*
age0t6	Age 0 to 6
age1t14	Age 1 to 14
age25t64	Age 25 to 64
child5_pc	child5_pc

educlvl	See educlvl above
prmsch	Grade 33 to 43 (first degree) and currently attending school
tenure	1= owner-occupied 2= free public/private 3= rented public/ private 4_pc= XXXX
toilet	1= Flash Toilet 2= Other improved Latrine 3= Unimproved 3_pc= XXX 4= No toilet facility
waterdrink(ing)	1= Piped 2= Other improved 2_pc=XXXX 3= Unimproved