CHAPTER 2: SPATIAL ASPECTS OF POVERTY AND INEQUALITY

Introduction

This chapter reports on estimates of household income poverty at district level for the first time in Tanzania. Previously, poverty estimates obtained from household budget surveys were available at the regional level. By combining information from the population census and the household budget survey, it has proved possible to arrive at poverty estimates for smaller administrative areas. The availability of district level poverty information has many advantages. The information can be used, for instance, for improved targeting of anti-poverty programs, or to make budget allocations to districts more pro-poor by including poverty levels into the formulae for district budget allocations.

The poverty estimates for 119 districts are presented in the form of so-called poverty maps. An advantage of such a spatial representation of poverty is that it can be combined with other geographic data for social amenities like schools, health centres, or biophysical, environmental and agro-climatic information. Poverty maps can give visually oriented, more comprehensive and integrated data bases that can be immensely valuable for evidence-based development planning and policy formulation.

A spatial representation of poverty gives rise to new questions for research. For instance it provides pointers towards the importance of district characteristics in explaining poverty. It also provides insight into the extent to which physical isolation and poor agro-ecological endowments may affect communities' rates of poverty. Poverty mapping techniques also lend themselves to estimating poverty for small vulnerable groups such as orphans or people with disabilities, and to considering geographic inequality in greater detail. Inequality is further pursued in this chapter.

This chapter is organised as follows. The next two sections explore evidence of geographic disparities in poverty - in household income poverty as evidenced by data on household consumption - and in aspects of non-income poverty. Section two presents poverty maps and briefly discusses how they have been derived. Section three provides information taken from the National Bureau of Statistics' 2002 population census, from the Ministry of Education and Culture's basic statistics in education (2002, 2004) and from statistics of the Ministry of Health. In the final section we discuss some of the policy implications from this analysis.

Income poverty at regional and district level

Poverty estimates in Tanzania have, to date, been obtained from periodic surveys. Household Budget Surveys (HBS) have been conducted with detailed questions about income and expenditures from which poverty estimates were derived. The most recent household budget survey, conducted in 2000/01, provides regional estimates of income poverty. These estimates, presented in Table 1, show large differences among regions.

The estimates are unable to show variation in poverty within regions because the samples which generated these estimates were not large enough.

For planning purposes, poverty estimates for smaller administrative levels are most useful. To meet this demand Elbers, Lanjouw and Lanjouw [69] developed a small area poverty estimation method also known as poverty mapping. The method generates poverty estimates for relatively small geographical areas by enriching household budget survey data with census data which are available at much smaller levels of geographic disaggregations. The poverty mapping technique not only provides estimates of poverty at the district level but also generates regional poverty estimates with greater precision. Both are presented below.

To derive the poverty map for Tanzania, data from the 2000/01 Household Budget Survey were combined with the population data from the 2002 Tanzanian Housing and Population Census, both conducted by the National Bureau of Statistics (NBS). This method combines the strength of both data sources, i.e. the high level of detail on household income present in the HBS and the large number of observations of the population census.

The Tanzania poverty maps were derived in a four step procedure. The first step involved comparing the variables that are available in the HBS and the Census and selecting those variables that are defined and measured in an identical way. Once these variables were identified, the second step involved exploring the relationship between these variables and per capita consumption. As there is no information on income or consumption in the census, this was done through an analysis of HBS survey data. Regressions were estimated, explaining per capita consumption with variables such as household size, education and housing characteristics.

In the third step, the regression relation that was estimated for the HBS was used to infer for each household in the census its per capita consumption. This is possible because in step 1, common variables between the census and HBS were identified, and in step 2 a relation was estimated using variables that were present in both the HBS and the 2002 Population Census.

Finally, once consumption was derived for every household in the census, estimates such as the proportion of households that are poor, or indexes of inequality, were inferred and then mapped.

A more detailed explanation of the poverty mapping methodology and derived estimates will be published shortly. [70]

Poverty incidence is defined as the percentage of people below the basic needs poverty line. In Tanzania, the basic needs poverty line in 2000/01 was set to be TShs 262 per adult equivalent per day. [71]

[69] Elbers, Lanjouw J.C. and Lanjouw, P (2003). Micro-level estimation of Poverty and inequality. Econometrica, Econometric Society, vol 71(1), pages 355-364

[70] Blandina Kilama, Wietze Lindeboom et al., Where are the Poor in Tanzania, forthcoming

[71] National Bureau of Statistics (2001) Tanzania Household Budget Survey 2000/01

Income poverty estimates at regional level

As Table 14 illustrates, the regional poverty estimates derived from the household budget survey have high standard errors.[72] By combining the HBS data with census information, new regional poverty estimates have been derived with much smaller standard errors. They are also shown in Table 14.

Table 14. Percentage of households below the basic needs poverty line, by region, 2000/01

REGION	Households below poverty line original (HBS)		Households below poverty line simulated (poverty map)	
	estimate %	std error	estimate %	std error
Dodoma	34	5.5	32	3.1
Arusha/Manyara	39	7.0	31	1.4
Arusha	-	-	21	1.5
Manyara	-	-	43	2.4
Kilimanjaro	31	6.3	28	1.3
Tanga	37	5.8	26	1.3
Morogoro	29	3.0	28	1.9
Pwani	46	8.3	38	2.1
Dar es Salaam	18	2.7	19	1.2
Lindi	53	14.1	39	2.3
Mtwara	38	4.3	38	2.0
Ruvuma	41	8.3	37	2.1
Iringa	29	5.3	28	1.6
Mbeya	21	5.1	23	1.1
Singida	55	4.8	49	3.4
Tabora	26	3.7	40	2.1
Rukwa	31	3.9	36	2.0
Kigoma	38	3.7	38	2.3
Shinyanga	42	6.5	43	2.4
Kagera	29	8.9	29	2.0
Mwanza	48	6.3	43	1.7
Mara	46	8.4	50	2.6

Source: HBS 2001 and Blandina Kilama, Wietze Lindeboom et al., Where are the Poor in Tanzania, forthcoming

For Dodoma, the new estimate is 32 per cent with a standard error of 3.1, and a 95 per cent confidence range of between 26 per cent and 38 per cent. Poverty mapping, therefore, has generated estimates of regional poverty rates with greater precision than the previously

[72] Standard errors are the usual measures of the precision with which a number has been estimated. If a poverty estimate is 30 per cent with a standard error of 2, we can be 95 per cent confident that the real poverty rate will lie between 30 plus or minus twice the standard error of 2, ie between 26 per cent and 34 per cent. High standard errors imply that estimates are imprecise and therefore less useful. An example is taken from Table 14. According to the HBS, the rate of poverty in Dodoma is 34 per cent with a standard error of 5.5. This implies that with 95 per cent confidence we can claim that the percentage of households in Dodoma who are poor is between 23 per cent and 45 per cent, a range so wide that it is almost uninformative.

available estimates.[73] The new estimates are not significantly different from the HBS's estimates, except for Tabora.

Income poverty estimates at district level

Using the poverty mapping technique, which allows for lower level estimation of poverty, we are able to estimate poverty at district level. Because districts are smaller, with correspondingly smaller sample sizes than regions, standard errors are higher. But in more than 90 per cent of the cases, standard errors of the resulting district estimates were below the standard errors of the HBS's regional estimates. Appendix Table A.10 provides the district level point estimates and their standard errors.

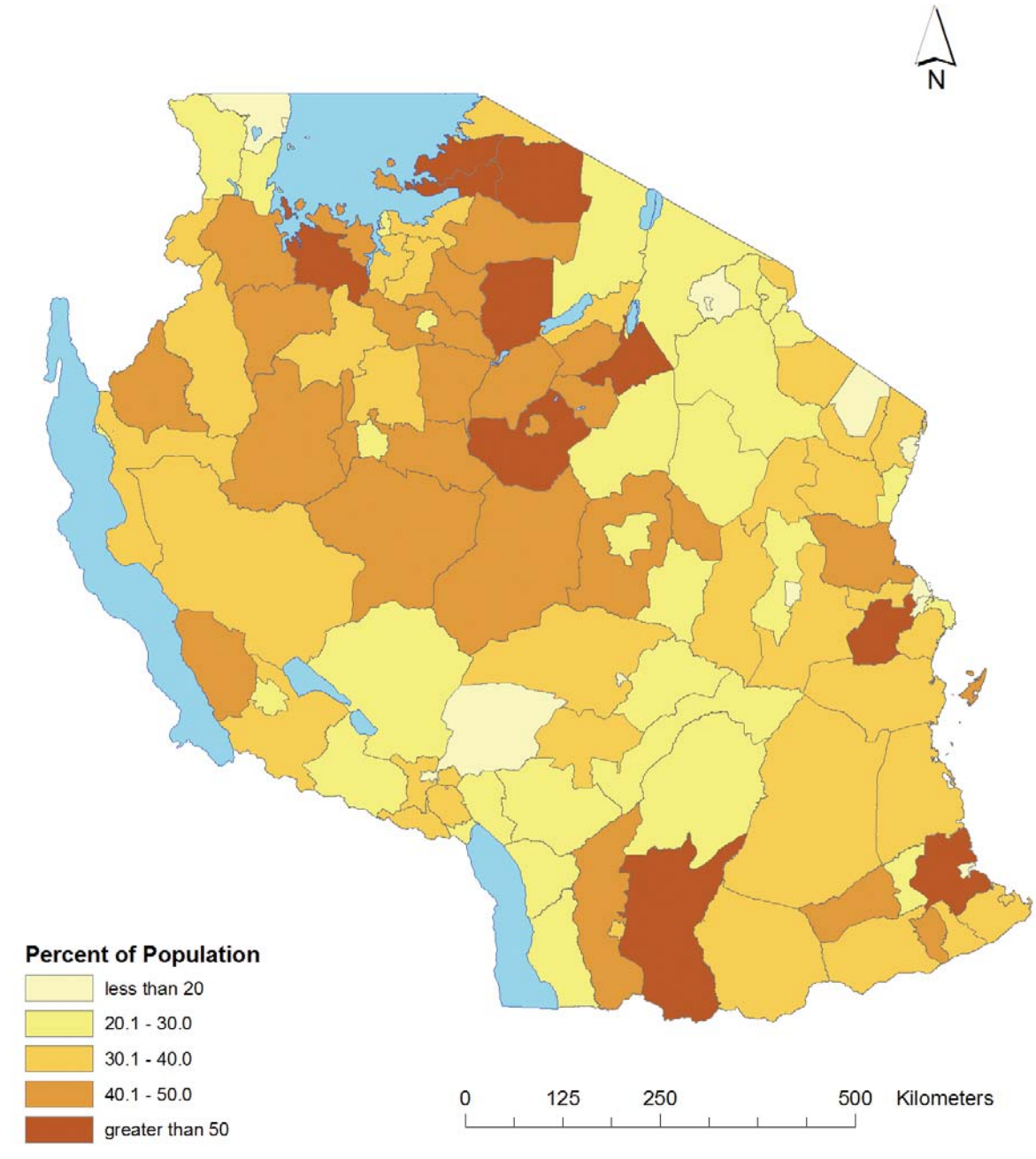
The highest rates of income poverty are estimated in Bunda (68 per cent), Musoma Rural (64 per cent), Geita (62 per cent), Serengeti (61 per cent) and Singida rural (56 per cent), all with more than half the population living below the basic needs poverty line. The lowest rates of income poverty are estimated in Bukoba Urban (11 per cent), Arusha Urban (12 per cent), Mbeya Urban (12 per cent), Mbarali (13 per cent), Morogoro Urban (14 per cent) and Kinondoni (14 per cent), all with less than 15 per cent of the population living below the basic needs poverty line. The map shows a tendency for the poorer areas to be clustered, whereas better-off areas are more scattered and mainly located in and around urban centres.

The map 2.1 and the data in the appendix table A 10 show differences in income poverty among districts. A measure of the extent of inequality is provided by the Gini coefficient, and this has been calculated for income poverty as well as for indicators of non-income poverty. The results are shown in Table 15 below.[74] It is clear from the table that access to improved water is the most inequitably distributed, and that income poverty rates are more unequal among districts than are under-five mortality rates, adult literacy rates and net primary enrolment. The value of the coefficient for net primary enrolment shows that there is little inequality in enrolment rates among the districts.

[73] As the HBS was drawn from the 1988 National Master Sample, the population census and the HBS used a different rural-urban classification for some of the enumeration areas. In addition, the distribution of household size in the HBS differed substantially from the distribution in the census. Differences in de jure and de facto definitions may explain part of this difference. HBS under-reports smaller households, which was not expected and is difficult to explain. Weights were applied to adjust for these differences. It matters which classification and which weights were used for regional poverty estimates. The second column in Table 14 presents poverty estimates that followed the HBS classification and weights. The fourth column presents poverty estimates that used the census classification and weights.

[74] The higher the value of the coefficient, the greater the inequality among districts. If the coefficient had a value of 1, there would be perfect inequality. A coefficient value of 0 means perfect equality – all districts would have the same poverty rates and values of non-income poverty.

Map 2.1 Percent of Population Below the Basic Needs Poverty Line by District, 2001



SOURCE: Calculations from Population Census 2002 and Household Budget Survey , 2000/01

Table 15. Measures of inequality and variation: Gini coefficient, Theil index and its decomposition

	Gini coefficient	Overall Theil index	Within region variation	Between region variation
Income poverty	0.20	0.071	47.3%	52.7%
Adult literacy rates	0.11	0.018	46.3%	53.7%
Net primary enrolment	0.08	0.008	40.8%	59.2%
Access to improved water	0.29	0.160	37.4%	62.6%
Under-five mortality	0.16	0.047	26.4%	73.6%

Source: Authors' calculations, Kilama and Lindeboom et al., Where are the Poor in Tanzania, forthcoming

Table 15 also shows values for the Theil index and its disaggregation, measuring the extent to which variations across districts are due to differences across regions or to differences within regions.[75] The Theil index for income poverty is 0.071, of which 47 per cent is attributable to inequalities within regions and 53 per cent to inequalities between regions. This disaggregation helps determine at what level more effective programming might take place. In the case of income poverty, interventions at district level need to be complemented equally with more regional approaches.

This is not always the case, as can be seen in Table 15. Applying the Theil index to under-five mortality, for instance, results in 74 per cent of the overall variation attributable to between-region differences and only 26 per cent to within-region differences. This implies that there are more generally common factors which determine rates of under-five mortality than there are district-specific factors, and that a more general approach to reducing under-five mortality is needed than in the case of income poverty. There are intermediate conclusions for strategies to deal with water supplies, where the differences between regions account for 63 per cent of the overall difference, and variation within regions accounts for 37 per cent.

The low value of the Theil index for net primary enrolment indicates that there was little overall variation in the estimates, and therefore that the disaggregation into within-regional and between-regional differences is not so important.

[75] See Shorrocks (1984). The decompositions are implemented using S. P. Jenkins's Stata program, ineqdeco