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Poverty Maps of Bangladesh - 2010

Technical Report

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TABLE OF CONTENTS

Acknowledgements

The World Bank team involved in preparation of the Poverty Maps included Faizuddin Ahmed, Naomi Ahmad, Mehar Akhter, Dean Jolliffe, MehrinMahbub, Iffath Sharif, Nobuo Yoshida, and Salman Zaidi (task leader), working under the guidance of VinayaSwaroop (Sector Manager, SASEP) and Johannes Zutt (Country Director, Bangladesh, Nepal, and Bhutan). The World Food Programme (WFP) team included MahabubulAlam, Nusha Choudhury, and KayenatKabir, working under the guidance of Christa Räder (Country Representative, WFP). The BBS team included Md. ZahidulHoqueSardar, Dipankar Roy, AKM Tahidul Islam, Md. Abdul Latif, Dinesh Roy, Enayet Hossain, Md. Rezaul Karim, and Md. Jibon Miah. Faizuddin Ahmed spearheaded the extensive analytical work to derive the regionally disaggregated poverty estimates using the 2010 HIES and 2011 Population Census data sets. MahabubulAlam and Faizuddin Ahmed prepared the various poverty maps presented in this report using GIS software.

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1. Introduction

Poverty mapping is a statistical exercise to estimate the incidence of poverty at sub-national levels to enable the government, civil society organizations, and development partners to accurately identify locations with a relatively higher concentration of poor people. Due to the considerable demand from policy makers, planners, and researchers for more disaggregated poverty estimates, the current poverty mapping exercise was initiated in September 2012 by the Bangladesh Bureau of Statistics (BBS), the World Bank, and the World Food Program (WFP) to produce reliable poverty estimates for key sub-national administrative units (zila and upazila) using data from both the 2010 Household Income and Expenditure Survey (HIES) and the 2011 Population Census.[1] According to this latest population census conducted by BBS, the total population of Bangladesh was about 150 million. For administrative purposes the country is divided into 7 divisions, 64 districts, and 544 *upazilas /thanas*.

Table 1 :Administrative Structure of Bangladesh

Division	Number of Districts	Number of Upazilas
Bangladesh	**64**	**544**
Dhaka	17	163
Chittagong	11	111
Rajshahi	8	70
Rangpur	8	58
Khulna	10	64
Sylhet	4	38
Barisal	6	40

The HIES is conducted by BBS every 4-5 years, and is the main source of data for official poverty related statistics in Bangladesh. The World Bank has provided extensive technical assistance to BBS over the past two decades to help improve the quality and timeliness of data collected through this survey. The official poverty estimates are computed from the HIES at the National and Division-level only due to the limited sample size of the survey.

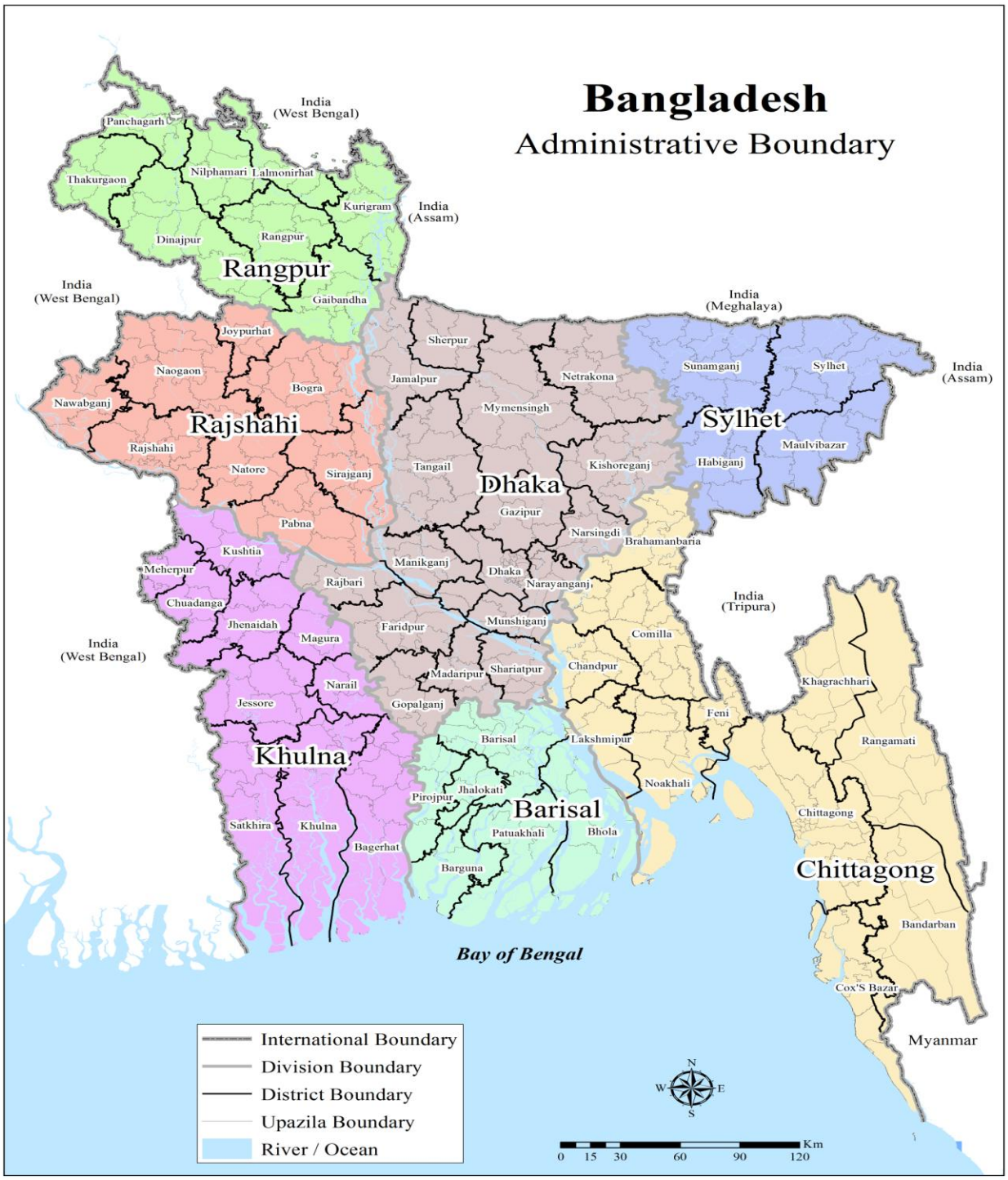
Table 2 : Upper and Lower Poverty Estimates for Bangladesh (2010 HIES)[2]

	Headcount Poverty Rate (percent)	
Division	**Upper Poverty Line**	**Lower Poverty Line**
Bangladesh	**31.5**	**17.6**
Dhaka	30.5	15.6
Chittagong	26.2	13.1
Rajshahi	29.7	16.0
Rangpur	42.3	27.7
Khulna	32.1	15.4
Sylhet	28.1	20.7
Barisal	39.4	26.7

Source: 2013 Bangladesh Poverty Assessment, World Bank.

[1]Two other such poverty mapping exercises have been carried out earlier in Bangladesh using data from (i) the 2000 HIES and 2001 Population Census and (ii) the 2005 HIES and the 2001 Population Census.

[2]The definition of the upper and lower poverty lines can be found in the 2013 *Bangladesh - Poverty Assessment: Assessing a decade of progress in reducing poverty, 2000-2010* (http://documents.worldbank.org/curated/en/2013/06/17886000/bangladesh-poverty-assessment-assessing-decade-progress-reducing-poverty-2000-2010).



According to the latest 2010 HIES based estimates, poverty incidence in Bangladesh varies from a low of 26.2 percent in Chittagong division to a high of 42.3 percent in Rangpur division. Similarly, the incidence of extreme poverty (i.e. estimates based on the lower poverty line) varies from 13.1 percent in Chittagong division to 27.7 percent in Rangpur division.

2. Poverty Mapping

A. Methodology

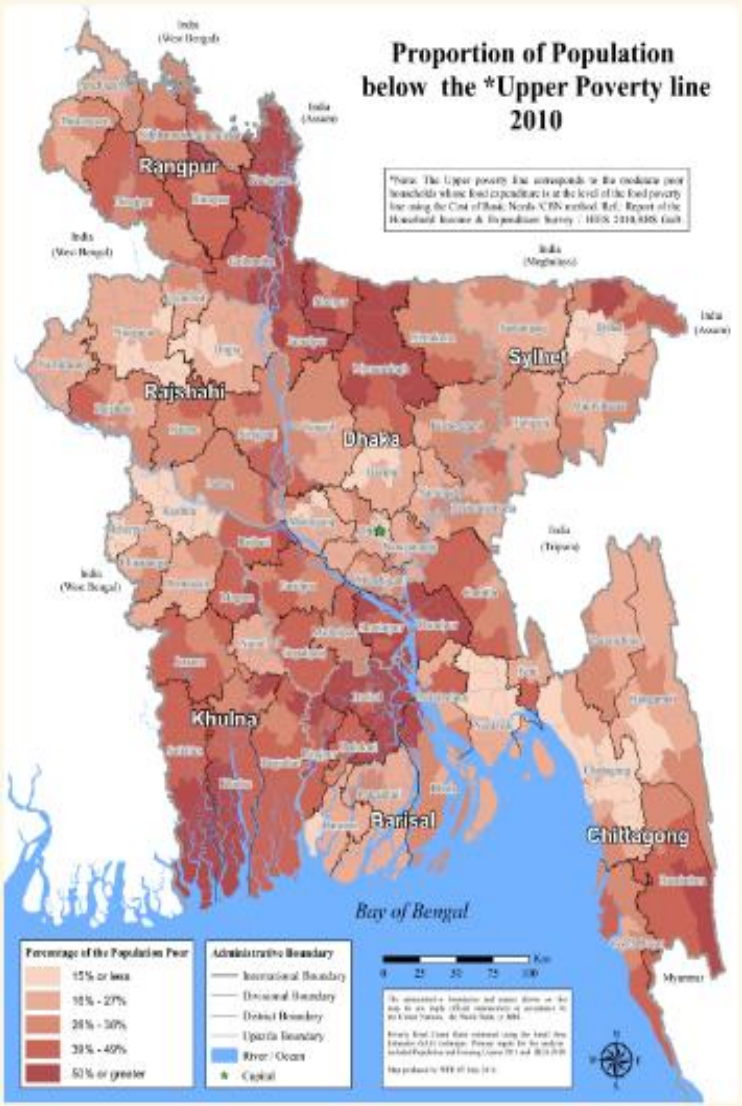
The poverty mapping methodology used in this exercise is the so-called ELL method developed by Elbers, Lanjouw, and Lanjouw(2003) using Small Area Estimation (SAE) techniques. The ELL method, which has been widely tested and validated around the world, takes advantage of the strengths of both sources of data used in such exercises.

The HIES includes the extremely rich data collected in an integrated household survey, including expenditure data. However this is for a relatively limited sample of households. On the other hand, the Population Census includes all households in the country, but collects data for a limited set of topics. The two data sets, HIES and Population Census, have common set of explanatory variables. The SAE technique uses the parameter estimates from a consumption model derived using the 2010 HIES data to predict/simulate consumption data for each census household. These predicted/simulated consumption data for all 2011 census households are then used to estimate poverty rates at the zila and upazila level using the same poverty lines used to derive the official poverty estimates using the 2010 HIES data.

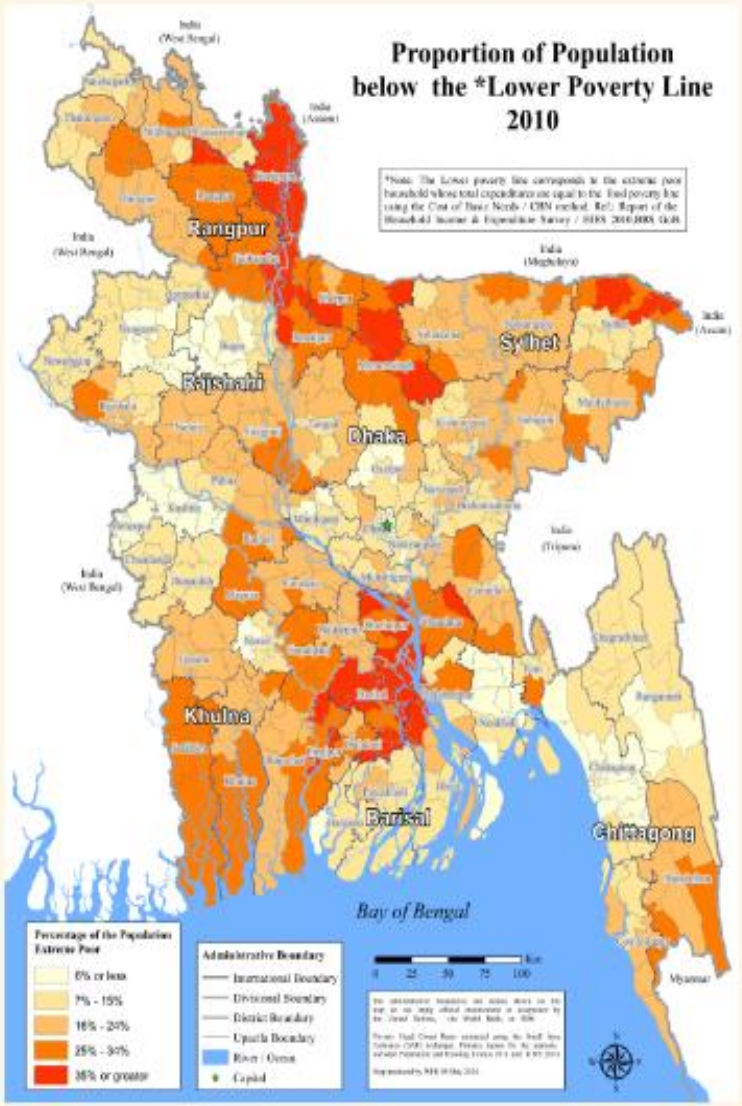
Poverty estimates for the Bangladesh Poverty Map and Extreme Poverty Maps were derived by using the upper and lower poverty lines in the *HIES 2010* report published by BBS, which were also used in the World Bank's latest Poverty Assessment.[3]The spatial distribution of poverty in Bangladesh at the upazila level is presented in the two maps below.

[3] The methodology used to derive the poverty lines is briefly described in the Annex. Further details can be found in can be found in *Bangladesh - Poverty Assessment: Assessing a decade of progress in reducing poverty, 2000-2010*World Bank, 2013).

Bangladesh Poverty Map



Bangladesh Extreme Poverty Map



The poverty maps were prepared by the Bangladesh Bureau of Statistics, the World Bank, and the World Food Program. The printing and dissemination of the maps was funded by IFAD.

B. Main Data Sources

The primary data sources generally used in the Small Area Estimation (SAE) method are a nationally representative household survey and a national population census. The Bangladesh Poverty Mapping of 2010 used the primary data of the 2010 Household Income and Expenditure Survey(HIES) and the 2011 Population Census.As a national statistical organization, Bangladesh Bureau of Statistics collects through HIES, a wide range of data covering many socio economic and demographic information such as detailed information on consumption and income , employment, ownership of asset, housing condition, access to education, health and sanitation etc. The sample size of 2010 HIES was 12,240 households, and most of the variables were representative at the division level.

Through the 2011 Population Census BBS collected a wide range of data on household and individual characteristics, including employment, housing conditions, educational attainment, sources of drinking water, access to sanitation, electricity, etc. As a global practice, population census does not include consumption and income data. BBS collected census data covering around 32 million households in Bangladesh.

C. Technical Challenges

The previous poverty mapping exercise in Bangladesh was done using Population Census 2001 and HIES 2005 data. Back then, the long interval between population census 2001 and HIES 2005 posed a significant technical limitation and challenge. Applying SAE method, a consumption model was derived in HIES 2005 by regressing per capita consumption expenditure on a set of common variables present in both HIES 2005 and population census 2001. The model was then used to predict per capita household expenditure for each household in the census.This approach works well if one can assume that consumption pattern between 2001 and 2005 did not change much. While this assumption may be reasonable for a short interval of time, it is more problematic for a longer interval (e.g. the 4 year gap between 2001 and 2005) as many structural changes may happen during this period. Changes in consumption patterns can introduce biases in the poverty estimates and their standard errors derived from the ELL method. To mitigatethis potential problem, only time invariant variables – i.e. variables whose mean did not change much between 2001 and 2005 – were selected for the consumption model and this approach was found to be effective in reducing biases.

As the current poverty mapping exercise of Bangladesh used 2010 HIES and 2011 population census data, the issue of long interval between census and survey could not come as a great technical challenge. But still then, every efforts were made to select those common variables whose means did not change much between 2010 HIES and 2011 population census. In fact, we computed the 95 percent confidence interval of all variables for HIES 2010. If the census mean of these variables fell within the 95 percent confidence ranges, we took those variables for the consumption modeling.

Tarrozi and Deaton (2008) have highlighted a number of concerns with the ELL methodology, in particular as summarized below:

1) Differences in consumption patterns within a stratum can bias both the poverty estimates and the standard errors. The ELL method estimates a consumption model that is assumed to apply to all households within each stratum, the implicit assumption being that the relationship between the household consumption expenditures and its correlates is the same for all households within the domain, and that all remaining differences are due not to structural factors, but attributable to errors. This is not a minor assumption and is explicitly acknowledged as such in ELL (2003).

2) Misspecification in the error structure can lead to an overstatement of the precision of the poverty estimates. The poverty mapping software (PovMap2) developed by the World Bank research department, in its current configuration, can accommodate only two layers of errors: at the level of household and at the level of some unit of aggregation above the household. In the current poverty mapping exercise for Bangladesh, the mauza level was selected for this higher level of aggregation. However, as Tarrozi and Deaton have noted, there could be correlation in errors also at some higher level viz. union, upazila, or zila. If the ELL method is applied ignoring the existing correlationof errors at these higher levels, then the standard errors of poverty estimates can be understated, resulting in an overly optimistic assessment of their statistical precision. While one obvious solution to this issue is to allow for multi layers of errors during consumption modeling, thisis not a practical or feasible solution for practitioners using the PovMap2 software. Instead, special attention was given in the present exercise to undertake a set of validation exercises on the basis of indirect empirical evidence (Please see section 4 and 5).

D. Production of the Bangladesh Poverty Maps of 2010

In poverty mapping procedure, two key aspects need to be paid special attention:

- Selecting sound consumption models
- Selecting the appropriate level of disaggregation

As elaborated below, careful execution of the poverty mapping software is critical, despite the convenience and user-friendliness of the PovMap2 software. Although, the PovMap2 software makes this process easier by providing various statistics toguide users, each step must be checked carefully.

Selection of Consumption Model:

For the current poverty mapping exercise, a total of 18 consumption models,of which 16 correspond to the strata defined in HIES 2010, were createdto capture the regional variations,. The other two models relate to rural & urban areas of Rangpur, a new division that was created from Rajshahi division after 2010. According to the results of HIES 2010, it is evident that Rangpur division is a poverty prone area, with significant variation in poverty rates between it and the rest of Rajshahi division. Consequently the creation of two additional models for this new division was a logical next step.

Levels of Disaggregation:

The ELL method producesnot only poverty estimates but also standard errors associated with these estimates, which can be very helpful to practitioners when deciding on the appropriate level of disaggregation of the poverty estimates. Table 1 summarizes standard errors of the poverty estimates at four different levels and by percentile. The table shows that standard errors on average (median) at all levels are small. Even at the 95th percentile, the standard errors at all levels are reasonably low. However, the maximum number at union level reaches nearly 22 percentage points which is indeed quite high,

meaning that the 95 percent confidence interval of the corresponding poverty estimate has a range of +/- 44 percentage points from the poverty estimate—i.e. the true poverty rate of this union can be anywhere between 0 and 100 percent with 95 percent probability. This result indicate that Bangladesh poverty mapping estimates should preferably not be disaggregated beyond the upazila level (one level abovetheunion level) to avoid reaching an unacceptably low level of statistical reliability.

Table 3 : Assessment of Simulation Results at Various Levels

Standard Errors of Poverty Estimates (%)

Percentile	Stratum	Zila	Upazila	Union
Median	1.2	1.8	2.2	3.8
95 %	1.6	4.5	5.2	7.7
Max	1.9	6.2	10.7	21.5

3. Results at a Glance

Division Level Poverty Estimates

The poverty estimates derived through this Poverty Mapping exercise are quite close to those obtained from the 2010 HIES. The minor differences between these two sets of estimates (as summarized in the table below) are partly to be expected, since the methods used in the Poverty Mapping exercise match predicted consumption (i.e. not poverty rates) at the *Mauza/Mahalla* level in the two data sets – i.e. 2010 HIES and 2011 Population Census(see Annex 3).

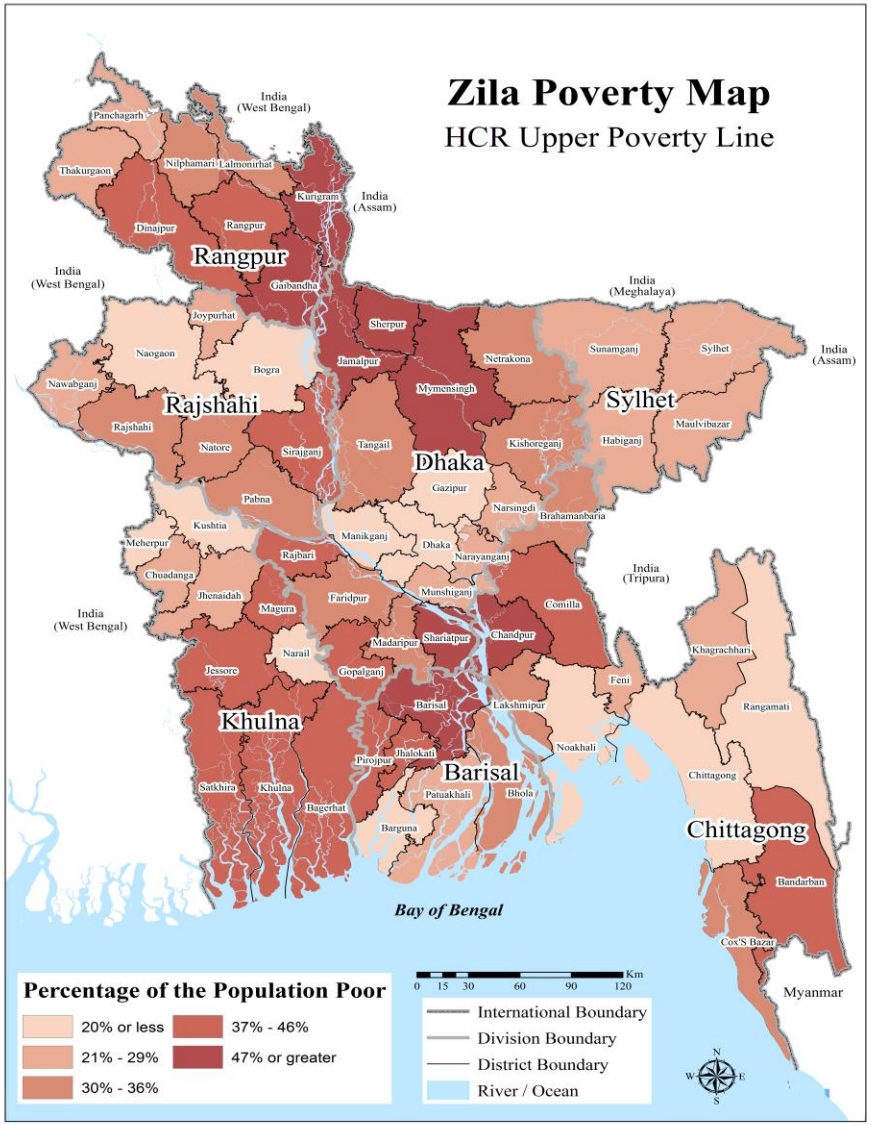
Table 4 :Comparison of Poverty Estimates: 2010 HIES and Poverty Mapping

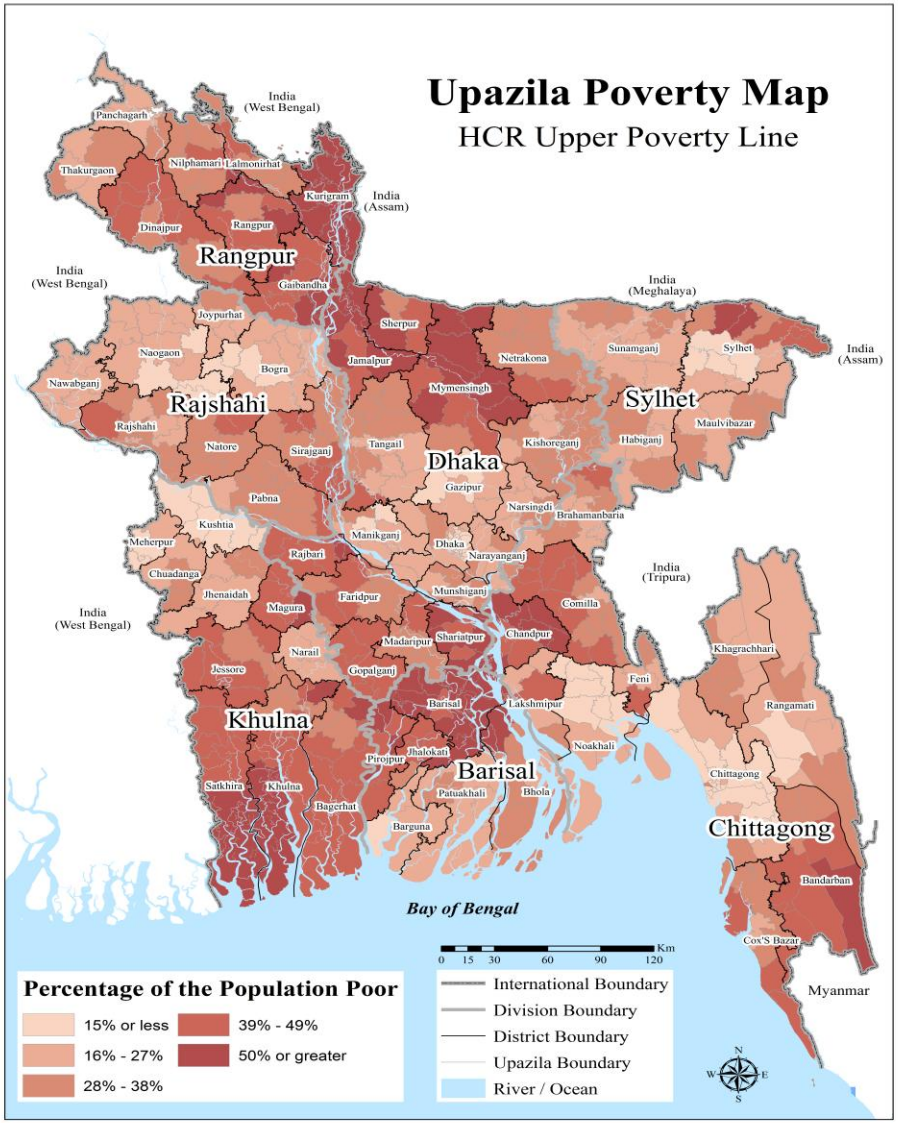
	HIES	Poverty Mapping Exercise	
Division	**2010 Poverty Headcount (Percent)**	**2010 Poverty Headcount (Percent)**	**Number of Poor (as % of overall population)**
Bangladesh	**31.5**	**30.7**	**100.0**
Dhaka	30.5	30.5	32.3
Chittagong	26.2	26.1	16.8
Rajshahi	29.7	27.4	11.6
Rangpur	42.3	42.0	15.0
Khulna	32.1	31.9	11.4
Sylhet	28.1	25.1	5.7
Barisal	39.4	38.3	7.3

- Poverty estimates for Bangladesh based on both the HIES and the poverty mapping exercises show that Rangpur and Barisal divisions have the highest poverty incidence of poverty, while Chittagong and Sylhet have the lowest incidence.
- Because of their large overall populations, Dhaka division (32.3 percent) and Chittagong division (16.8 percent) have the highest share of Bangladesh's poor.
- Compared to other divisions, Sylhet division has both the lowest headcount rate (25.1 percent) as well as the lowest number of poor people (5.7 percent of the country's poor).

Zila Level and Upazila Level Poverty Maps

As the following maps illustrate, the resolution of spatial variation in poverty incidence improves considerably on moving from the division to zila level and upazila level poverty maps - there is considerable spatial variation in poverty incidence within individual divisions.


Zila Poverty Map
HCR Upper Poverty Line
India (West Bengal)
India (Assam)
India (Meghalaya)
India (Tripura)
Myanmar
Bay of Bengal
Rangpur
Rajshahi
Sylhet
Dhaka
Khulna
Barisal
Chittagong
Panchagarh
Thakurgaon
Nilphamari
Lalmonirhat
Kurigram
Dinajpur
Gaibandha
Joypurhat
Sherpur
Naogaon
Bogra
Jamalpur
Nawabganj
Mymensingh
Netrakona
Sunamganj
Rajshahi
Natore
Sirajganj
Tangail
Kishoreganj
Habiganj
Maulvibazar
Pabna
Gazipur
Narsingdi
Brahamanbaria
Kushtia
Manikganj
Meherpur
Rajbari
Narayanganj
Chuadanga
Jhenaidah
Faridpur
Munshiganj
Comilla
Magura
Madaripur
Shariatpur
Chandpur
Narail
Khagrachhari
Jessore
Gopalganj
Feni
Barisal
Lakshmipur
Rangamati
Noakhali
Piroipur
Jhalokati
Satkhira
Khulna
Patuakhali
Bhola
Bagerhat
Barguna
Bandarban
Cox'S Bazar
Percentage of the Population Poor
20% or less
21% - 29%
30% - 36%
37% - 46%
47% or greater
0 15 30 60 90 120 Km
International Boundary
Division Boundary
District Boundary
River / Ocean
N
W
E
S


Upazila Poverty Map
HCR Upper Poverty Line
India (West Bengal)
India (Assam)
India (Meghalaya)
India (Tripura)
Myanmar
Bay of Bengal
Rangpur
Rajshahi
Sylhet
Dhaka
Khulna
Barisal
Chittagong
Panchagarh
Thakurgaon
Nilphamari
Lalmonirhat
Kurigram
Dinajpur
Gaibandha
Joypurhat
Sherpur
Naogaon
Bogra
Jamalpur
Nawabganj
Mymensingh
Netrakona
Sunamganj
Rajshahi
Natore
Sirajganj
Tangail
Kishoreganj
Habiganj
Maulvibazar
Pabna
Gazipur
Narsingdi
Brahamanbaria
Kushtia
Manikganj
Meherpur
Rajbari
Narayanganj
Chuadanga
Jhenaidah
Faridpur
Munshiganj
Comilla
Magura
Madaripur
Shariatpur
Chandpur
Narail
Khagrachhari
Jessore
Gopalganj
Feni
Barisal
Lakshmipur
Rangamati
Noakhali
Piroipur
Jhalokati
Satkhira
Khulna
Patuakhali
Bhola
Bagerhat
Barguna
Bandarban
Cox'S Bazar
Percentage of the Population Poor
15% or less
16% - 27%
28% - 38%
39% - 49%
50% or greater
0 15 30 60 90 120 Km
International Boundary
Division Boundary
District Boundary
Upazila Boundary
River / Ocean
N
W
E
S

Key features of the variation in poverty incidence at the zila level are highlighted below:

Table 5 :Variation in Headcount Rate by Division

Division	Average Poverty Rate	Minimum Rate	Maximum Rate
Dhaka	30.5 percent	15.7 percent Dhaka district	52.6 percent Shariatpur district
Chittagong	26.1 percent	9.6 percent Noakhali district	51.0 percent Chandpur district
Rajshahi	27.4 percent	16.6 percent Bogra district	38.7 percent Sirajganj district
Rangpur	42.0 percent	26.7 percent Panchagarh district	63.7 percent Kurigram district
Khulna	31.9 percent	3.6 percent Kushtia district	46.3 percent Satkhira district
Sylhet	25.1 percent	24.1 percent Sylhet district	26.0 percent Sunamganj district
Barisal	38.3 percent	19.0 percent Barguna district	54.8 percent Barisal district
Overall Bangladesh	30.7 percent	3.6 percent Kushtia district	63.7 percent Kurigram district

Table 6 :Population, Number of Poor, and Headcount Rate in Bangladesh by District

Division	Zila	#Upazilas	Population	Number Poor	Headcount
DHAKA	**17 districts in total**	**163**	**45,762,841**	**13,972,226**	**30.5**
	SHARIATPUR	6	1,146,046	602,581	52.6
	JAMALPUR	7	2,277,919	1,163,677	51.1
	MYMENSINGH	12	5,046,655	2,547,466	50.5
	SHERPUR	5	1,352,039	654,755	48.4
	GOPALGANJ	5	1,158,216	494,505	42.7
	RAJBARI	5	1,041,978	436,525	41.9
	FARIDPUR	9	1,888,142	686,208	36.3
	NETRAKONA	10	2,215,484	781,883	35.3
	MADARIPUR	4	1,157,997	403,913	34.9
	KISHORGONJ	13	2,880,856	872,936	30.3
	TANGAIL	12	3,548,352	1,055,432	29.7
	MUNSHIGANJ	6	1,409,831	404,116	28.7
	NARAYANGANJ	5	2,847,240	744,072	26.1
	NARSINGDI	6	2,180,550	517,906	23.8
	GAZIPUR	5	3,235,402	626,340	19.4
	MANIKGANJ	7	1,376,134	254,098	18.5
	DHAKA	46	11,000,000	1,725,814	15.7
CHITTAGONG	**11 districts in total**	**111**	**27,904,587**	**7,273,642**	**26.1**
	CHANDPUR	8	2,388,365	1,217,085	51.0
	BANDARBAN	7	373,273	149,575	40.1
	COMILLA	16	5,303,074	2,010,667	37.9
	COX'S BAZAR	8	2,250,089	735,531	32.7
	LAKSHMIPUR	5	1,699,556	530,006	31.2
	BRAHMANBARIA	9	2,820,084	847,110	30.0
	FENI	6	1,406,908	363,971	25.9
	KHAGRACHHARI	8	599,899	152,808	25.5
	RANGAMATI	10	576,536	117,111	20.3
	CHITTAGONG	25	7,417,706	854,181	11.5
	NOAKHALI	9	3,069,097	295,596	9.6

Division	Zila	#Upazilas	Population	#Poor	Headcount
RAJSHAHI	**8 districts in total**	**70**	**18,252,001**	**5,008,480**	**27.4**
	SIRAJGANJ	9	3,070,468	1,188,618	38.7
	NATORE	6	1,682,265	589,704	35.1
	PABNA	9	2,503,504	789,824	31.5
	RAJSHAHI	13	2,527,816	794,002	31.4
	JOYPURHAT	5	900,984	240,529	26.7
	NAWABGANJ	5	1,638,958	414,749	25.3
	NAOGAON	11	2,581,033	434,989	16.9
	BOGRA	12	3,346,973	556,065	16.6
RANGPUR	**8 districts in total**	**58**	**15,482,473**	**6,508,616**	**42.0**
	KURIGRAM	9	2,051,530	1,306,462	63.7
	GAIBANDHA	7	2,365,117	1,135,938	48.0
	RANGPUR	8	2,727,182	1,260,516	46.2
	DINAJPUR	13	2,930,171	1,111,722	37.9
	NILPHAMARI	6	1,816,564	632,814	34.8
	LALMONIRHAT	5	1,249,519	431,372	34.5
	THAKURGAON	5	1,360,454	367,747	27.0
	PANCHAGARH	5	981,936	262,046	26.7
KHULNA	**10 districts in total**	**64**	**15,445,562**	**4,923,496**	**31.9**
	KUSHTIA	6	1,929,302	69,878	3.6
	MEHERPUR	3	651,920	99,204	15.2
	NARAIL	3	717,156	143,202	20.0
	JHENAIDAH	6	1,758,472	434,194	24.7
	CHUADANGA	4	1,121,841	310,218	27.7
	KHULNA	14	2,218,316	860,533	38.8
	JESSORE	8	2,722,805	1,062,501	39.0
	BAGERHAT	9	1,447,373	619,480	42.8
	MAGURA	4	912,168	413,786	45.4
	SATKHIRA	7	1,966,209	910,500	46.3
SYLHET	**4 districts in total**	**38**	**9,784,451**	**2,457,690**	**25.1**
	SYLHET	12	3,365,878	810,579	24.1
	HABIGANJ	8	2,073,516	524,070	25.3
	MAULVIBAZAR	7	1,901,486	488,895	25.7
	SUNAMGANJ	11	2,443,571	634,145	26.0
BARISAL	**6 districts in total**	**40**	**8,223,589**	**3,151,833**	**38.3**
	BARGUNA	5	884,747	168,098	19.0
	PATUAKHALI	7	1,518,520	391,080	25.8
	BHOLA	7	1,765,082	585,326	33.2
	JHALOKATI	4	676,302	273,910	40.5
	PIROJPUR	7	1,099,095	484,476	44.1
	BARISAL	10	2,279,843	1,248,944	54.8

- Poverty incidence in the 10 poorest upazilas in Dhaka division is 55 percent or higher; by contrast, poverty incidence in the 10 richest upazilas is less than 4 percent.
- Similarly poverty incidence in the 6 poorest upazilas of Chittagong division is 50 percent or higher, while that in the 6 richest upazilas is less than 4 percent.
- Even the poorest division of Bangladesh has considerable spatial variation in concentration of poverty: the incidence of poverty in the 11 richest upazilas in Rangpur division is lower

than the national average; by contrast, poverty incidence in the 7 poorest upazilas is more than twice the national average (i.e. it is 60+ percent).

- While Sylhet division is amongst Bangladesh's most well-off regions, over 50 percent of the population of Gowainghatupazila lives below the national poverty line; similarly, 3 upazilas in Khulna division have a poverty rate of 50 percent or higher.

Table 7 :Richest and Poorest Upazilas by Division

Division	Upazila	Population	#Poor	Headcount
DHAKA	**163upazilas in total**	**45,762,841**	**13,972,226**	**30.5**
3 Richest	MOTIJHEEL	184,854	2,403	1.3
	BIMAN BANDAR	8,350	109	1.3
	DHANMONDI	129,815	1,776	1.4
5 Poorest	DHOBAURA	195,175	113,586	58.2
	GOSAIRHAT	156,416	91,244	58.3
	DEWANGANJ	256,539	150,097	58.5
	PHULPUR	599,947	352,742	58.8
	NANDAIL	400,675	243,059	60.7
CHITTAGONG	**111 upazilas in total**	**27,904,587**	**7,273,642**	**26.1**
3 Richest	DOUBLE MOORING	345,272	23	0.0
	KOTWALI	292,683	778	0.3
	PANCHLAISH	210,442	1,609	0.8
5 Poorest	THANCHI	22,527	11,950	53.0
	MATLAB DAKSHIN	207,963	111,577	53.7
	HAJIGANJ	327,901	176,210	53.7
	KACHUA	378,499	213,059	56.3
	HAIM CHAR	108,032	66,222	61.3
RAJSHAHI	**70 upazilas in total**	**18,252,001**	**5,008,480**	**27.4**
3 Richest	KAHALOO	221,474	25,878	11.7
	SHAJAHANPUR	279,247	34,986	12.5
	ADAMDIGHI	193,757	25,288	13.1
5 Poorest	BERA	255,993	100,955	39.4
	SHAHJADPUR	556,927	232,565	41.8
	BELKUCHI	348,558	147,985	42.5
	GODAGARI	329,218	145,338	44.1
	CHAUHALI	159,283	72,494	45.5
RANGPUR	58upazilas in total	15,482,473	6,508,616	42.0
3 Richest	TENTULIA	124,773	26,869	21.5
	PIRGANJ	240,733	55,982	23.3
	ATWARI	133,099	32,013	24.1
5 Poorest	BHURUNGAMARI	230,639	150,246	65.1
	ULIPUR	393,074	256,751	65.3
	RAJARHAT	182,464	123,506	67.7
	PHULBARI	159,682	109,358	68.5
	CHAR RAJIBPUR	73,154	50,346	68.8

Division	Upazila	Population	#Poor	Headcount
KHULNA	**64 upazilas in total**	**27,904,587**	**7,273,642**	**26.1**
3 Richest	KUSHTIA SADAR	490,158	14,922	3.0
	MIRPUR	328,710	11,003	3.3
	BHERAMARA	198,999	6,790	3.4
5 Poorest	KOYRA	193,301	94,980	49.1
	TEROKHADA	115,758	57,420	49.6
	CHITALMARI	138,261	69,143	50.0
	SHYAMNAGAR	314,770	157,983	50.2
	MOHAMMADPUR	207,394	105,304	50.8
SYLHET	**38 upazilas in total**	**18,252,001**	**5,008,480**	**27.4**
3 Richest	DAKSHIN SURMA	249,563	25,712	10.3
	BISHWANATH	229,614	28,794	12.5
	SYLHET SADAR	789,139	112,655	14.3
5 Poorest	JAINTIAPUR	161,103	55,827	34.7
	JURI	148,268	53,806	36.3
	ZAKIGANJ	234,557	91,510	39.0
	KANAIGHAT	262,546	120,179	45.8
	GOWAINGHAT	286,433	150,625	52.6
BARISAL	**40 upazilas in total**	**18,252,001**	**5,008,480**	**27.4**
3 Richest	PATHARGHATA	162,556	20,977	12.9
	BAMNA	79,209	13,505	17.1
	MIRZAGANJ	121,192	21,536	17.8
5 Poorest	BAKERGANJ	310,455	171,915	55.4
	GAURNADI	185,815	103,038	55.5
	MULADI	172,582	100,462	58.2
	HIZLA	144,496	89,963	62.3
	MHENDIGANJ	298,801	192,326	64.4

4. Assessment of the Results in terms of Various Key Statistics

The Poverty Mapping exercise of 2010 also included a number of validation checks to assess the reliability and consistency of the poverty estimates:

A. Comparison of Poverty Mapping estimates and HIES 2010 estimates

HIES 2010 follows a stratified sample design whereby estimates derived from these data are representative at the division and urban-rural level. Figure 1 illustrates the consistency checks using 95 percent confidence intervals from both the HIES 2010 as well as the Poverty Mapping exercise. These two estimates will be consistent if their 95 percent confidence intervals are overlapping. As the figure below clearly shows, both estimates are overlapping in almost all the strata. Another interesting observation is that the range of confidence intervals of poverty mapping estimates is much narrower than that of the direct HIES 2010 estimates which indicates that the former(Poverty Mapping) estimates have much lower margin of error than the latter (i.e. the HIES 2010 direct estimates).

Figure 1: Comparison between poverty estimates from HIES 2010 and SAE method

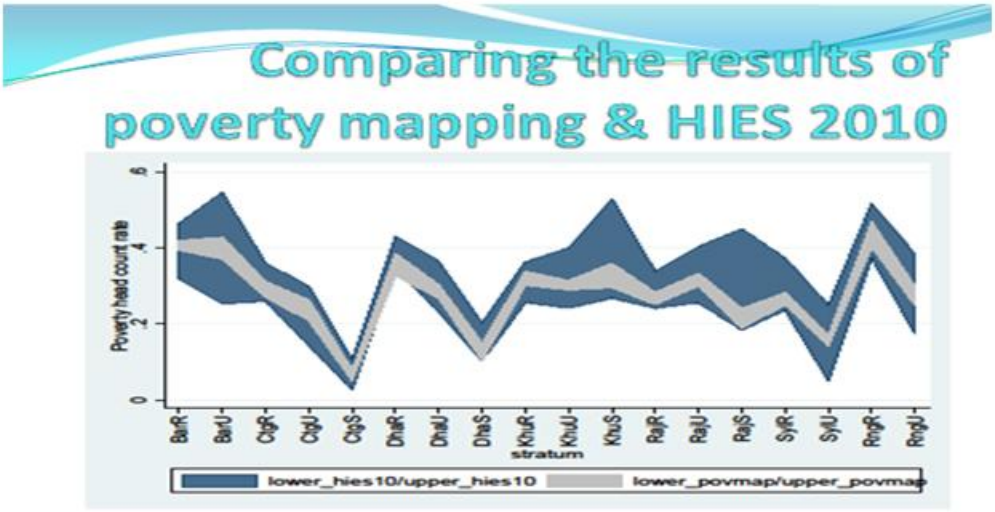
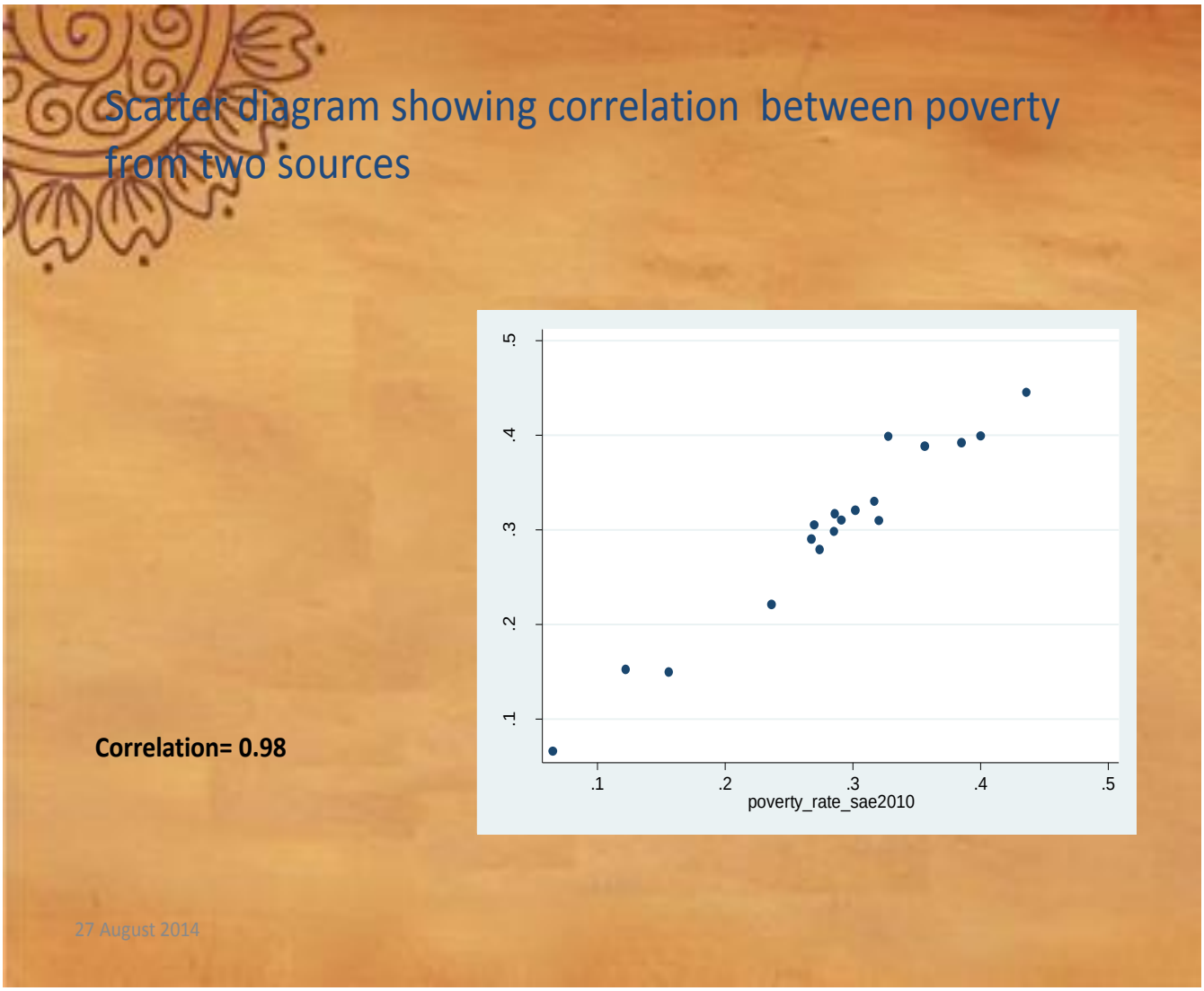


Figure 1a bellow presents the scatter diagram of the poverty estimates from two sources at stratum level. If we look at the diagram, we see the dots falling almost in a straight line. This clearly indicates a very high correlation between the two poverty estimates. We have computed the simple correlation coefficient and found it to be 0.98, which is indeed a very high correlation.

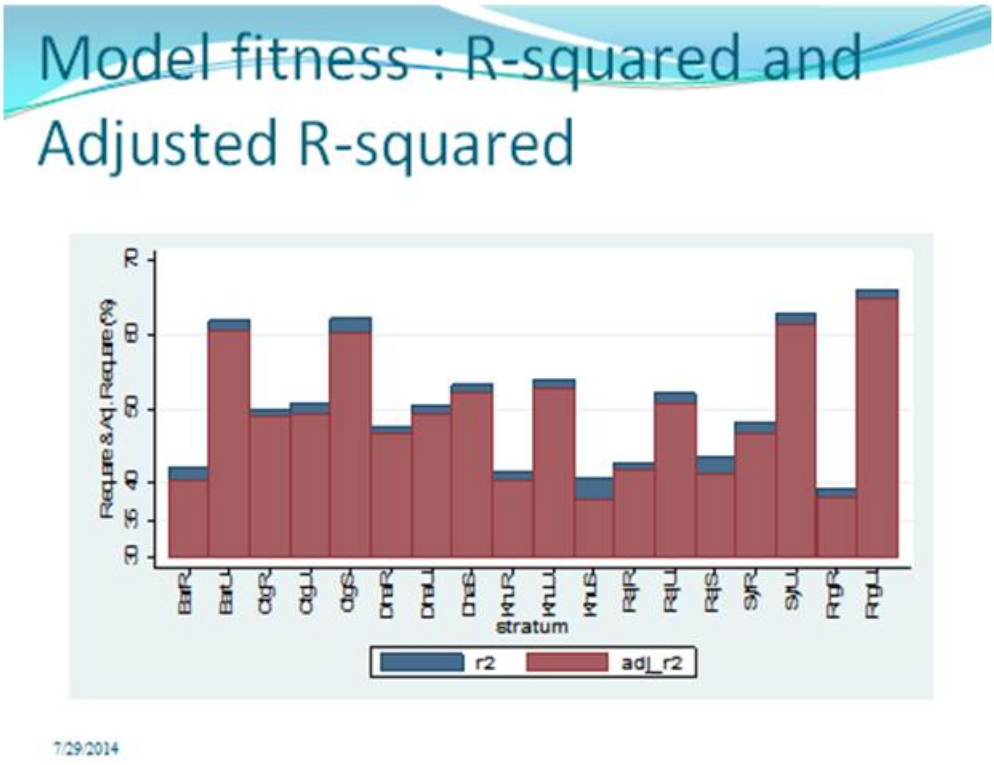
Figure 1a :Comparison of poverty estimates showing degree of correlation between the two estimates.



B. Explanatory power of consumption models (Model fitness)

The goal of the consumption model is to produce the most reliable and precise estimates of poverty. One measure of the specification of the model is model fit, measured by R-square and adjusted R-square. R-square measures the proportion of the variability in the target variable explained by the predictors. In other words, it provides information on how well a consumption model can predict the actual consumption expenditure of each census household. Adjusted R-square is a modification of R-square that adjusts for the degrees of freedom (df) in the model. Generally, the higher the R-square, the better predicted expenditure fits actual household expenditure. In the Bangladesh poverty mapping of 2010, both R-square and adjusted R-square are high (Figure 2). Regressions using cross sectional data normally tend to have lower R-square than panel or longitudinal data. Internationally, even with an R-square around 30 percent, some reasonably successful small area estimates have been produced.

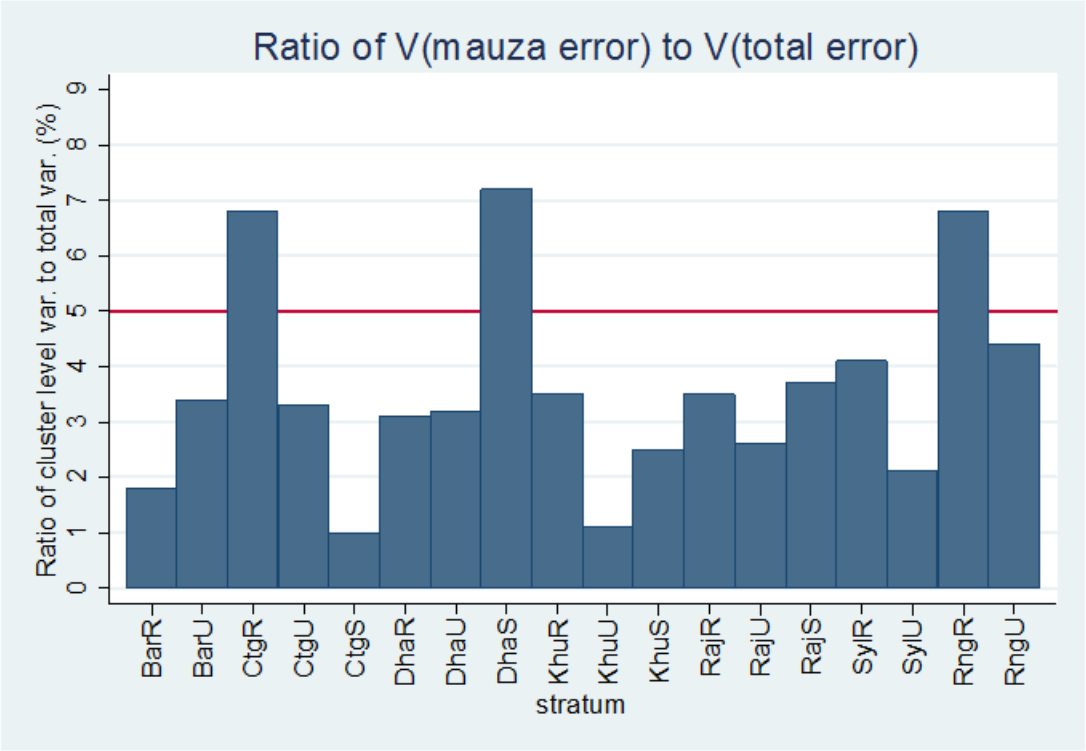
Figure 2: Stratum level R-square and Adjusted R-square



C. Share of Variance of Residuals at Cluster Level

The consumption models in general capture only part of the variations in household expenditures,with the unexplained variations simply treated as residuals or errors. In the current poverty mapping exercise, these residuals are separated into two layers- the household layer and the cluster (mauza for rural area and mahalla for urban area) layer. The cluster effects are included in the consumption models since consumption expenditures can be affected by location specific factors that are common across all the households in the particular cluster or location of which some are observable and others are not. Since cluster effects can reduce the precision of the poverty or inequality estimates, great effort should be taken so that variation in consumption may be captured by observables as far as possible. If mauza or mahalla level effect is large, reliability of poverty estimates is low. A rough rule of thumb often used in this regard is whether the share of variance of this cluster effect to the total variance is 10 percent or less. One strategy for reducing the share of the variance of cluster effect is to include more area or location specific variables in the consumption models. In the current poverty mapping exercise, such location specific variables have been constructed by aggregating data from the Population Census. Besides, GIS data and data from Business Register 2009 at upazila level were also included in the regression models. This approach worked well in minimizing the share of cluster level effectfor the current Poverty Mapping exercise. Figure 3presents the share of the variance of cluster level effect by region (stratum): almost all strata except #3(Chittagong Rural), #8 (Dhaka Statistical Metropolitan Area) and #17 (Rangpur Rural) have the share of variance of cluster level effect less than 5 percent.

Figure 3 : Share of cluster level error



D. Incidence of Trimming

The ELL method, at the time of simulation, randomly draw regression coefficients including residuals or errors from their corresponding distributions as estimated in the survey based consumption models. This random drawing of parameters (regression coefficients & errors) can at times pick up some extreme values, although with a low probability. Thus the simulated household expenditures may include a few outliers. Fortunately, PovMap2 software has the option to eliminate these outliers before estimating povertyorinequality indicators.This adjustment, often called "trimming", is required since a few outlier values can produce large biases, particularly in inequality statistics. However, trimming is a practical solution, and does not follow any rigorous statistical theory per se. Consequently, when constructing consumption models, care should be taken to do it in such a way as to minimize the need for trimming. Table 8 summarizes the incidence of trimming at different levels, and shows that at the level of stratum &zila, the incidence of trimming is low. Even at Upazila and Union levels, the incidence of trimming is also fairly low up to the 95th percentile. However, the maximum number at the union level is as high as 35 percent which means that more than one third of the simulated expenditures were dropped before estimating poverty headcount rates, further confirming that Bangladesh poverty estimations of 2010 should not be disaggregated below the Upazila level

Table 8 : Incidence of trimming at various levels

Share of trimmed simulated expenditures(%)

Percentile	Stratum	Zila	Upazila	Union
Median	0.10	0.13	0.08	0.05
95%	1.10	0.69	0.79	0.81
Max.	3.10	2.48	15.16	35.07

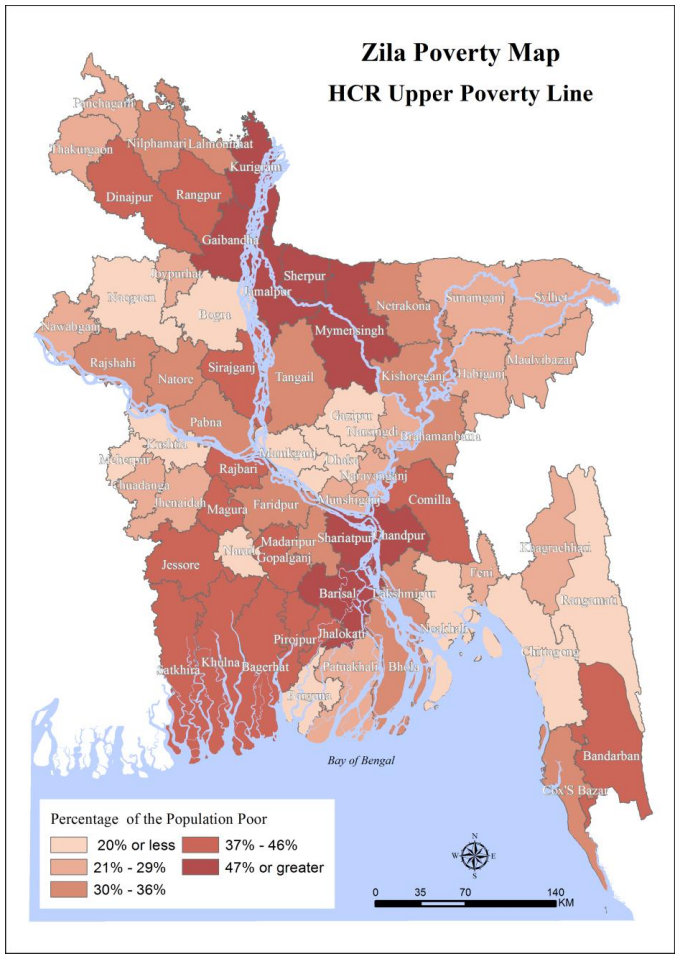
7/31/2014

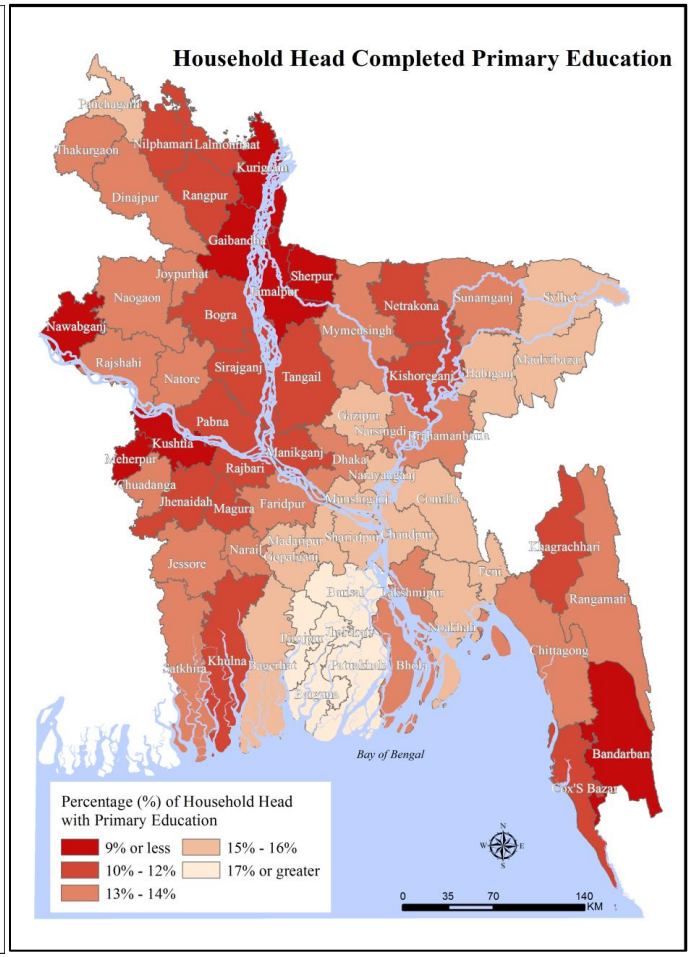
5. Key Correlates of Poverty Incidence in Bangladesh

As illustrated in the two sets of maps presented below, the poverty maps can also be compared with other geographic and regional characteristics that are likely correlated with poverty incidence.

A. The Poverty Map and Educational Attainment of Household Heads

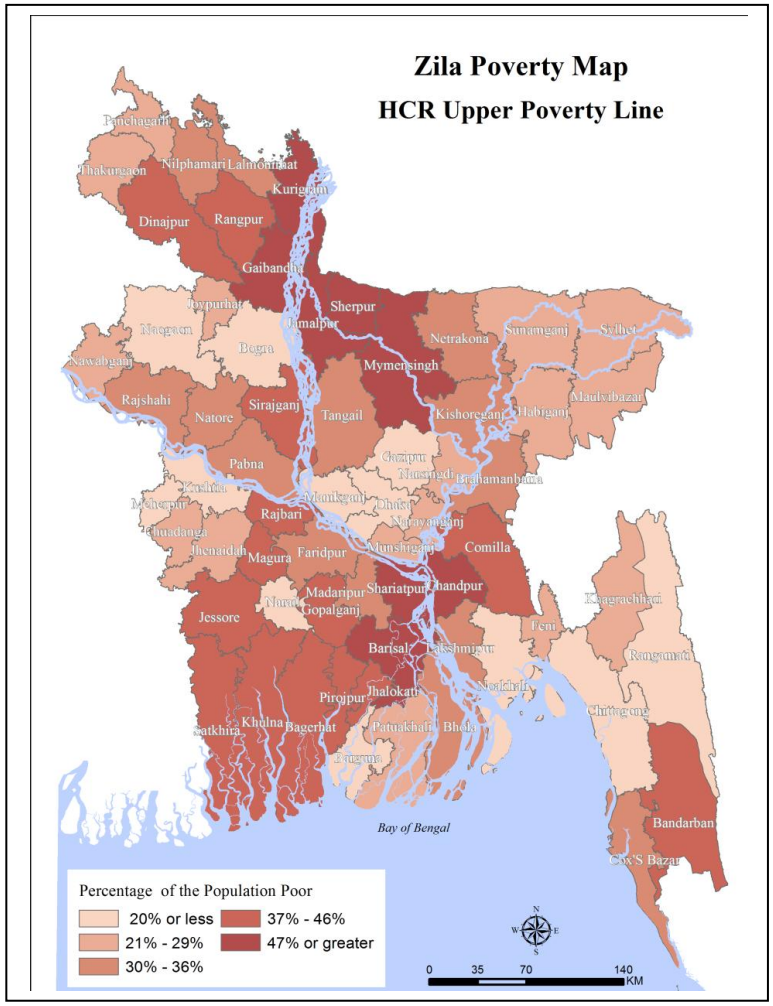
The maps below compare poverty rates with educational attainment of household heads (2011 Population Census data). Darker areas on the maps correspond to areas with high poverty rates and lower rates of completion of primary education. As the maps show, districts in north and southeastern Bangladesh whose poverty rates are high also suffer from low primary school completion

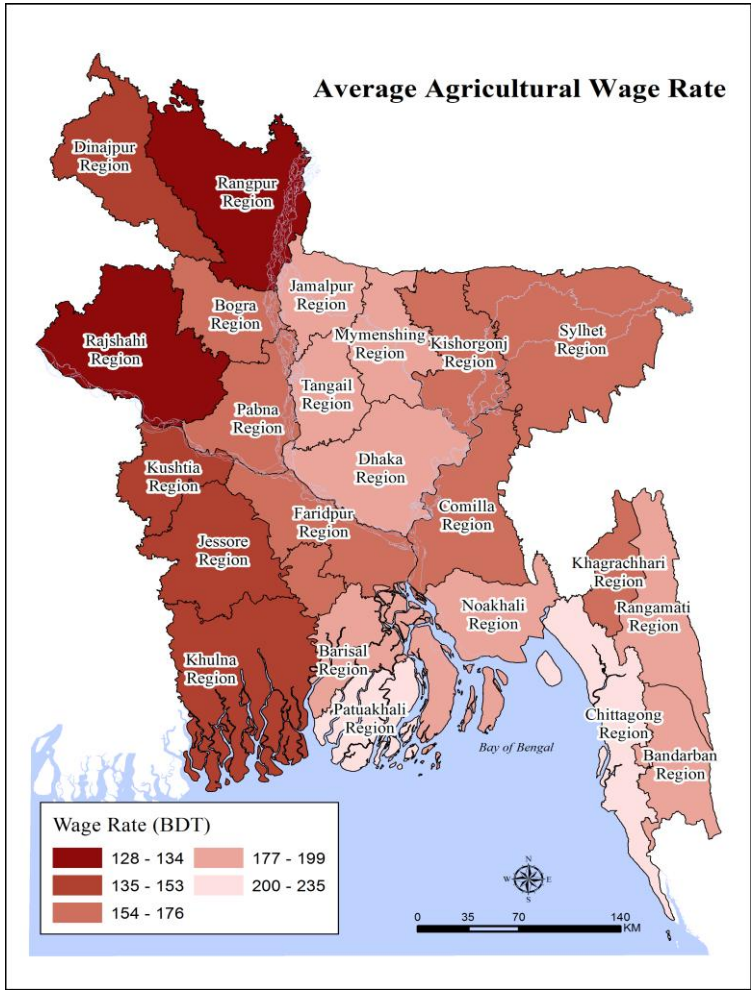




B. The Poverty Map and Average Agricultural Wage Rate of Male Laborers

The maps below contrast poverty rates with average agricultural wages rates (BBS data), and illustrate the negative association between these two variables. Darker areas on the maps correspond to areas with high poverty rates and low wage rates.





C. Comparison between the Poverty Maps and Perceptions Map

The reliability of the poverty maps can be evaluated by comparing the estimates obtained from the poverty mapping exercise with the results of the Perception Survey on Relative Prevalence of Poverty commissioned by the WFP. This was carried out in 2014 in 16 districts (BagerhatBandarbanBograChandpurGazipurHabiganjLakshmipurManikganjNaogaonNilphamari PanchagarhPatuakhaliRangamatiSirajganjSunamganj, Thakurgaon)across Bangladesh.

The participatory key informant based pair wise comparison tool was used as the main instrument for the perception survey. The approach involves structured interviews with key informants to capture both qualitative perception and quantitative estimates on poverty within an upazila. They key informants sequentially compared one geographic region with another, hence the tool has been named pair wise comparison. Inherent in the tool is the consistency check with purpose of validating the informant's knowledge.Knowledgeable respondents from 3 groups (local government body and local people, local government officials, and NGO workers, UN field officials and community workers) in each of the 16 districts covered by the survey were asked to estimate the poverty rate in each of the upazilas in their particular district, yielding a total of 125 observations on estimated poverty rates for the 125 upazilas covered.

The upazila level poverty estimates from the Poverty Mapping exercise derived using both the upper and lower poverty lines can be regressed against the poverty estimates obtained from the Perceptions survey to ascertain the degree of correlation between the two sets of independent estimates.[4] Since there is some debate about whether such a regression should be run with a constant term or alternately whether the constant term should be suppressed, we report both sets of estimates below (i.e. with and without the constant term included in the regressions).

	Lower Poverty Line Estimate		**Upper Poverty Line Estimate**	
	No Constant Term	**With Constant Term**	**No Constant Term**	**With Constant Term**
Number of observations	125	125	125	125
F (16, 109)	94.04	-	90.90	-
F (16, 108)	-	7.53	-	5.94
Prob.> F	0.0000	0.0000	0.0000	0.0000
Adj. R-squared	0.9225	0.4574	0.9200	0.3892
Coefficient of HCR	1.3923	0.9010	0.8202	0.4575
t-statistic	8.76	5.19	8.42	3.45
Prob.> | t |	0.000	0.000	0.000	0.001

The summary results reported above reveal a very high correlation between the two sets of poverty estimates (i.e. upazila level poverty rates obtained from the Perceptions survey and Poverty Mapping exercise respectively). In all instances, the positive correlation between the two sets of estimates is statistically significant at the 1 percent significance level, indicating there is very close conformance between these two independent exercises in the ranking of upazilas based on estimated poverty levels. This is true both for the poverty estimates based on the upper as well as the lower poverty lines. Overall, these results provide strong corroborating evidence of the robustness of disaggregated poverty estimates obtained from the Poverty Mapping exercise.

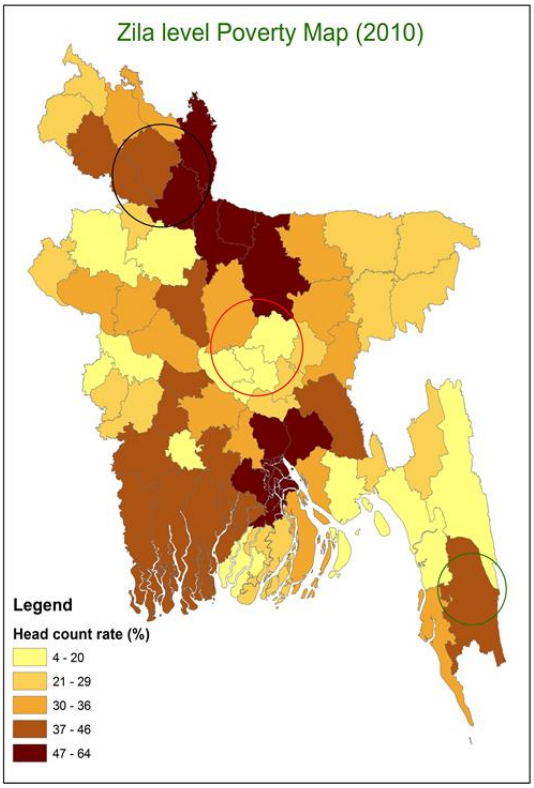
[4]When running the regressions, we included dummy variables at the district level to purge the effect of idiosyncratic differences between the various respondents in levels of their poverty estimates.

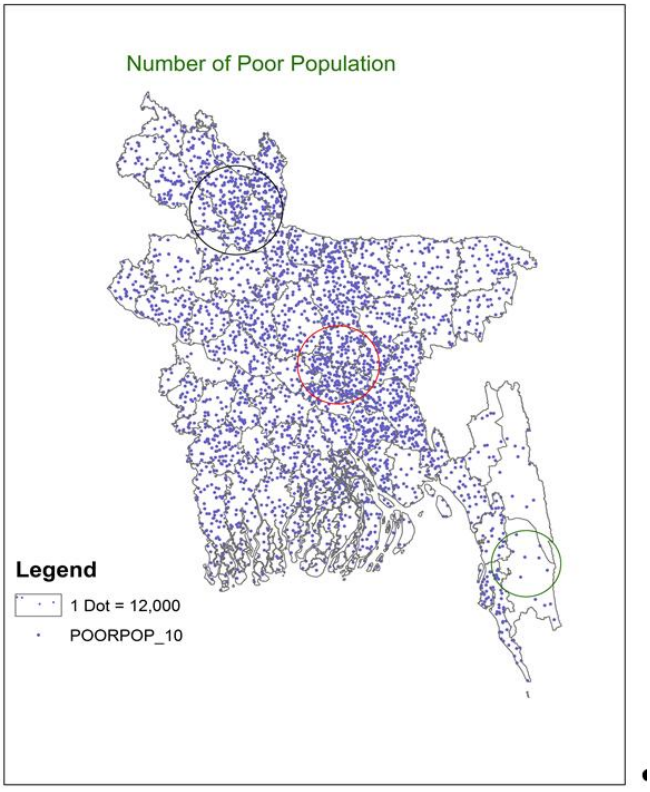
D. Poverty Headcount Rates Vs Number of Poor Population

The Poverty headcount rate refers to the proportion or percentage of poor population living bellow the poverty line. It reflects the incidence of poverty in a specific area. It is the most popular indicator of poverty. However, one can also look at the absolute number of poor population. Maps bellow compares the number of poor with the percentage or proportion of poor population. The map on the right shows the dot density of poor population by geographic location and the map on the left shows the percentage of the poor or headcount rates by Zila.

Geographic patterns of poverty in Bangladesh vary by location. There are some locations/areas, for instance, near Dhaka (circled in red)where poverty headcount is low but absolute number of poor population is large as can be seen from the map on the right by the greater number of dots within the same location/area. On the contrast, Bandarbanzila in Chittagong Hill Tract region (circled in green) record a high poverty headcount rate but the size of the poor population is very small. Also, there are areas, for instance, Rangpur region (circled in black) where both poverty rate and number of poor population are relatively high.

Zila level poverty maps showing headcount rates and number of poor population





6. Concluding Remarks

Poverty Mapping is a powerful tool for identifying and monitoring pockets of affluence and poverty across the country. The resultant maps provide a rich information base and can be used to help policy makers and development partners better plan their resource allocations, which in turn can contribute to faster and more effective poverty reduction. The usefulness of poverty maps can be further reinforced by combining them with other geo-referenced databases such as maps of human development indicators, maps of natural disasters, and maps of the impending impacts of climate change.

Annex 1: 2010 Poverty Lines and Poverty Headcount Rate Estimates

The Bangladesh Bureau of Statistics (BBS) organized a committee of expertsto produce the official 2010 poverty estimates. The 2010 poverty estimates were based on a Cost of Basic Needs (CBN) methodology, and were derived by adjusting the 2005 poverty lines to reflect changes in the cost of meeting basic needs. The adjustments to poverty lines (PL) for 2010 were obtained by: (i) updating 2005 food poverty lines with food inflation rates calculated from unit values of HIES 2005 and HIES 2010 data; and (ii) re-estimating the non-food poverty line using HIES 2010 data to adjust for the non-food allowance.

Using the CBN method, the PL represents the average level of per capita expenditure at which individuals can meet basic food and non-food needs. The CBN method is implemented in three steps. In the first step, the cost of a fixed food bundle is computed. In the case of Bangladesh, this bundle consists of eleven food items that include: rice, wheat, pulses, milk, oil, meat, fresh water fish, potato, other vegetables, sugar, and fruits. The bundle provides the minimal nutritional requirements that correspond to 2,122 kcal per day per person. In the second step, two different non-food allowances for non-food consumption are computed: the lower non-food allowance (the median amount spent on non-food items by households whose total consumption is approximately equal to their food-poverty line) and the upper non-food allowance (the amount spent on non-food items by households whose food consumption is approximately equal to their food-PL). In the third step, the food and non-food allowances are added together.

The sum of the food and upper non-food allowances constitute the upper poverty line (UPL), while the sum of the food and lower non-food allowance constitutes the lower poverty line (LPL).

Table 9 : Bangladesh Harmonized Poverty Lines 2000, 2005, and 2010

	2000		2005		2010	
Region	**LPL**	**UPL**	**LPL**	**UPL**	**LPL**	**UPL**
Barisal (Rural)	580	714	753	926	1284	1485
Barisal (Muni.)	643	764	800	951	1419	1963
Chittagong (Rural)	619	733	753	891	1404	1687
Chittagong (Muni.)	643	827	749	963	1495	1825
Chittagong (SMA)	639	978	766	1171	1479	1876
Dhaka (Rural)	563	651	728	842	1276	1497
Dhaka (Muni.)	625	742	749	890	1314	1793
Dhaka (SMA)	678	855	806	1018	1406	2038
Khulna (Rural)	511	582	652	743	1192	1435
Khulna (Muni.)	561	690	670	825	1262	1680
Khulna (SMA)	582	773	706	938	1348	1639
Rajshahi (Rural)	511	598	656	766	1236	1487
Rajshahi (Muni.)	575	707	696	857	1312	1585
Rajshahi (SMA)	576	682	722	856	1223	1556
Sylhet (Rural)	560	661	697	822	1240	1311
Sylhet (Muni.)	666	843	806	1020	1286	1558

Source: *Bangladesh - Poverty Assessment: Assessing a decade of progress in reducing poverty, 2000-2010* World Bank, 2013.

The table below presents the poverty and extreme poverty headcount rate estimates for Bangladesh (i.e. the proportion of the population that is deemed to be poor and extremely poor respectively) using the

above poverty lines and the 2000, 2005, and 2010 HIES data sets. The poverty rates are estimated from the survey data by computing the proportion of the country's population whose per capita expenditures are below the UPL, while the extreme poverty rates are estimated by computing the proportion of the country's population whose per capita expenditures are below the LPL.

Table 10 : Poverty Headcount Rates based on the 2000, 2005, and 2010 HIES

	Poverty			***Extreme Poverty***		
	2000	**2005**	**2010**	**2000**	**2005**	**2010**
National	48.9	40.0	31.5	34.3	25.1	17.6
Urban	35.2	28.4	21.3	19.9	14.6	7.7
Rural	52.3	43.8	35.2	37.9	28.6	21.1

Source: *All estimates are CBN based on HIES 2005, updated for 2010, and back-casted for 2000. 2010 update: survey-based food prices and non-food allowance re-estimated using "upper" poverty lines. Official Poverty Lines estimated for HIES (2000, 2005, and 2010).*

Annex2: Key Results of the Poverty Mapping Exercise

Barisal Rural [STRATUM 1]

Variables	Description of the variables	Estimated Coefficient
intercept	constant used in the model	7.7164246
CHLD0YRP	Proportion of 0yr child in the household	-0.8390937
DELECTRIC_1	Household with access to electricity	0.1853818
DHSEC_EDU_1	Head of household with higher secondary education	0.3646295
DNSLATRINE_1	Household with access to non-sanitary latrine	-0.2067275
DOTH_HOUSE_1	Not a pucca or semi-pucca house	-0.3057381
DOTH_WATER_1	Other than tap or tube-well water	0.2872642
DSEC_EDU_1	Head of household with secondary education	0.1675674
HD_AGE	Age of the head of household in years	4.40E-03
MEMBER	Household size	-6.60E-02
N15_59YRP	Proportion of 15-59 yr. persons in the household	0.4898133
N60PLUSP	Proportion of elderly persons (60+) in the household	0.4891679
P11_15FSCHNEW	Proportion of female children attending school	0.4865016
TPE_CONS	Total persons engaged in construction sector for 2009 at upazila level	-3.83E-03
_ZL$DPGRA_EDU_060	Zila=06 and head of the household not a post graduate	-0.4370122
_ZL$DPGRA_EDU_420	Zila=42 and head of the household not a post graduate	-0.3089488
_ZL$DPGRA_EDU_790	Zila=79 and head of the household not a post graduate	-0.3639935

Barisal Urban [STRATUM 2]

Variables	Description of the variables	Estimated coefficient
intercept	Constant used in the model	6.848
CHLD1_4P	Proportion of Children aged 1-4 yrs. In the household	-0.8179
DELECTRIC_1	Access to electricity in the household	0.3266
DHD_MARIED_1	Head of the household married	0.3355
DHD_SEX_1	Head of the household is a male person	0.4747
DJSEC_EDU_1	Head of the household with junior secondary education	-0.1964
DPUCCA_1	Main house of the household is pucca (cement/concrete)	0.3795
HD_AGE	Age of the head of household in years	0.0077
HD_EDU	Education grade completed by head of household	0.0477
MEMBERSQ	Squared household size	-0.0068
ZL_06	Dummy for zila=06	-0.3761
ZL_42	Dummy for zila=42	-0.2451

Chittagong Rural [STRATUM 3]

Variables	Description of the variables	Estimated Coefficient
intercept	Constant used in the model	7.68
DELECTRIC_1	Access to electricity in the household	0.19
DHD_LIT_1	Head of the household is literate	0.17
DJSEC_EDU_1	Head of the household with junior secondary education	-0.08
DNOLATRINE_1	Household with no latrine facility	-0.23
DNSLATRINE_1	Household access to non-sanitary latrine	-0.10
DOWNED_HH_1	Household owned the house	0.12
DPRI_EDU_1	Head of the household with primary education	-0.12
DPUCCA_1	Main house of the household is pucca	0.33
DSEMI_PUCA_1	Main house of the household is semi-pucca	0.20
MEMBER	Household size	-0.13
MEMBERSQ	Household size squared	0.01
N15_59YRP	Proportion of 15-59yr. Persons in the household	0.55
N60PLUSP	Proportion of elderly people(60 +) in the household	0.44
P11_15FSCHNEW	Proportion of female children aged 11-15yrs. attending school	0.40
P11_15MSCHNEW	Proportion of male children aged 11-15yrs. attending school	0.41
P6_10MSCHNEW	Proportion of male children aged 6-10yrs. attending school	0.19
ZL_13	Dummy for zila=13	-0.38
ZL_19	Dummy for zila=19	-0.31
ZL_75	Dummy for zila=75	0.22
_ZL#012$MEMBER	Dummy for zila=12 & household size	-0.02
_ZL#030$MEMBER	Dummy for zila=30 & household size	-0.06
_ZL#030$TPE_MFG	Dummy for zila=30 & total persons engaged in manufacturing	0.00
_ZL#051$TPE_MFG	Dummy for zila=51 & total persons engaged in manufacturing	0.00
_ZL$DHD_LIT_510	Dummy for zila=51 & head not literate	0.22
_ZL$DHD_LIT_511	Dummy for zila=51 & head literate	0.36

Chittagong Urban [STRATUM 4]

Variables	Description of the variables	Estimated Coefficient
Intercept	Constant used in the model	8.269
CHLD1_4P	Proportion of 1-4 yrs. Children in the household	-0.4084
DELECTRIC_1	Access to electricity in the household	0.1501
DGRA_EDU_1	Head of the household is a graduate	0.3995
DJSEC_EDU_1	Head of the household with junior secondary education	0.1086
DOWNED_HH_1	Household owns the house	0.1854
DPGRA_EDU_1	Head of the household with post graduate education	0.5051
DSEC_EDU_1	Head of the household with secondary education	0.2458
MEMBER	Household size	-0.2037

MEMBERSQ	Household size squared	0.0102
PRENTED_HH_M	Proportion of rented households at mauza level	0.4349
PRENTED_HH_UZ	Proportion of rented households at upazila level	-0.5855
TPE_SERV	Total persons engaged in the service sector at upazila level	0
ZL_13	Dummy for zila=13	-0.2853
ZL_30	Dummy for zila=30	0.4325
ZL_51	Dummy for zila=51	-0.4439
ZL_75	Dummy for zila=75	0.3614

Chittagong SMA [STRATUM 5]

Variables	**Description of the variables**	**Estimated Coefficient**
Intercept	Constant used in the model	8.6232
DHDNMUSLIM_1	Head of the household is a non-muslim	-0.1752
DPUCCA_1	Main house of the household is pucca	0.3666
DSLATRINE_1	Access to Sanitary latrine	0.3569
MEMBER	Household size	-0.3085
MEMBER2	Household size squared	0.0194
TPE_MFG	Total persons engaged in manufacturing at upazila level	0
TPE_MINING	Total persons engaged in mining at upazila level	-0.0034
TPE_SERV	Total persons engaged in service sector at upazila level	0.0001
TPE_TRADE	Total persons engaged in trade sector at upazila level	0.0001
TPE_TRANS	Total persons engaged in transport sector at upazila level	-0.0001

Dhaka Rural [STRATUM 6]

variables	**Description of the variables**	**Estimated Coefficient**
Intercept	Constant used in the model	7.1576
DELECTRIC_1	Access to electricity in the household	0.1253
DGRA_EDU_1	Head of the household is a graduate	0.1643
DHD_MARIED_1	Head of the household is married	0.0937
DHSEC_EDU_1	Head of the household with higher secondary education	0.1897
DISABLEP	Proportion of disable persons in the household	-0.2741
DSLATRINE_1	Access to sanitary (hygeneic) latrine in the household	0.1213
DTUBEWATER_1	Access to tube-well water in the household	0.1469
MEMBER	Household size	-0.155
MEMBER2	Household size squared	0.0086
N15_59YRP	Proportion of 15-59 yrs. persons in the household	0.5016
N60PLUSP	Proportion of elderly (60 +) persons in the household	0.5067
P11_15FSCHNEW	Proportion of female children (11-15 yrs.) attending school	0.2686
P11_15MSCHNEW	Proportion of male children (11-15 yrs.) attending school	0.4514

P6_10FSCHNEW	Proportion of female children (6-10 yrs.) attending school	0.1855
PEMPLOYED	Proportion of employed people in the household	-0.1921
PLITERATE	Proportion of literate persons in the household	0.4321
PNOLATRINE_M	Proportion of households with no latrine at mauza level	-0.3788
POTH_WATER_M	Proportion of households access to other water at mauza level	0.8625
TPE_SERV	Total persons engaged in service sector at upazila level	0
ZL_48	Dummy for zila==48	0.2313
ZL_56	Dummy for zila=56	0.1661
ZL_68	Dummy for zila=68	0.2553
ZL_72	Dummy for zila=72	0.1665
ZL_86	dummy for zila=86	-0.1547
_TPE_MFG$DELECTRIC#0	Interaction of TPE_MFG & household with no access to electricity	0
_ZL$DELECTRIC_331	Dummy for zila=33 and household with access to electricity	0.27
_ZL$DELECTRIC_820	Dummy for zila=82 and household with no access to electricity	-0.1506
_ZL$DELECTRIC_931	Dummy for zila=93 and household with access to electricity	0.2243
_ZL$DHD_LIT_350	Dummy for zila=35 and head of the household not literate	-0.1655
_ZL$DHD_LIT_611	Dummy for zila=61 and head of the household is literate	-0.0647
_ZL$DHD_LIT_671	Dummy for zila=67 and head of the household is literate	0.2356

Dhaka Urban [STRATUM 7]

Variables	**Description of the variables**	**Estimated Coefficient**
Intercept	Constant used in the model	7.6498
CHLD0YRP	Proportion of 0 yr. children in the household	-0.7232
CHLD1_4P	Proportion of 1-4 yr. children in the household	-0.6534
DELECTRIC_1	Household with access to electricity	0.2486
DGRA_EDU_1	Head of the household is a graduate	0.3505
DHD_LIT_1	Head of the household is literate	0.1328
DHD_MARIED_1	Head of the household is married	0.2186
DHD_SEX_1	Head of the household is a male person	0.1527
DHSEC_EDU_1	Head of the household with higher secondary education	0.4334
DPGRA_EDU_1	Head of the household with post graduate education	0.542
DPUCCA_1	Main house of the household is pucca	0.2883
DSEC_EDU_1	Head of the household with secondary education	0.2388
MEMBER	Household size	-0.1501
MEMBER2	Household size squared	0.0081
PNSLATRINE_UN	Proportion of households with non-sanitary latrine at union level	0.291
TPE_SERV	Total persons engaged in the service sector at upazila level	0
TPE_TRANS	Total persons engaged in the transport sector at upazila level	-0.0005
ZL_35	Dummy for zila=35	-0.2673
ZL_39	Dummy for zila=39	-0.4058
ZL_89	Dummy for zila=89	-0.4535

Dhaka SMA [STRATUM 8]

Variables	Description of the variables	Estimated Coefficient
Intercept	Constant used in the model	12.2286
CHLD1_4P	Proportion of 1-4 yr. children in the household	-0.6243
DHD_LIT_1	Head of the household is literate	0.2128
DPUCCA_1	Main house of the household is pucca	0.3018
DRENTED_HH_1	House is rented	-0.2187
DRENTFREE_1	House is rent free	-0.3184
HD_AGE	Age of head of the household in years	0.004
MEMBER	Household size	-0.2165
MEMBER2	Household size squared	0.0133
P11_15MSCHNEW	Proportion of male children aged 11 - 15 yrs attending school	0.4581
POWNED_HH_UZ	Proportion of households owning a house at upazila level	-4.326
PRENTED_HH_UZ	Proportion of households with a rented house at upazila level	-3.7776
TPE_SERV	Total persons engaged in service sectoe at upazila level	0
_ZL#067$TPE_MFG	Zila=06 and total persons engaged in manufacturing sector	0
_ZL$DSP_LIT_261	Zila=26 and spouse literate	0.1239

Khulna Rural [STRATUM 9]

Variables	Description of the variables	Coefficient
Intercept	Constant used in the model	7.0173
CHLD0YRP	Proportion of 0 yr. children in the household	-0.8907
CHLD1_4P	Proportion of 1 - 4 yr. children in the household	-0.5747
DELECTRIC_1	Household access to electricity	0.1529
DGRA_EDU_1	Head of the household is a graduate	0.3468
DHSEC_EDU_1	Head of the household with higher secondary education	0.3417
DRENTFREE_1	House is rent free	-0.1592
DSEC_EDU_1	Head of the household with secondary education	0.1193
DSLATRINE_1	Household has access to a sanitary latrine	0.1078
DSP_LIT_1	Spouse of the head of the household is literate	0.07
MEMBER	Household size	-0.0276
N15_59YRP	Proportion of 15 - 59 yr. people in the household	0.5395
N60PLUSP	Proportion of elderly (60+) people in the household	0.2505
ZL_18	Dummy for zila=18	0.1348
ZL_44	Dummy for zila=44	0.1801
ZL_50	Dummy for zila=50	0.5322
ZL_57	Dummy for zila=57	0.2821
ZL_65	Dummy for zila=65	0.3075

Khulna Urban [STRATUM 10]

Variables	Description of the variables	Estimated Coefficient
Intercept	Constant used in the model	6.7661
DGRA_EDU_1	Head of the household is a graduate	0.4683
DHDWID_DIV_1	Head of the household is widowed or divorced	-0.2731
DHSEC_EDU_1	Head of the household with a higher secondary education	0.181
DJSEC_EDU_1	Head of the household with a junior secondary education	-0.1523
DOWNED_HH_1	Household owned a house	0.0899
DSLATRINE_1	Household has access to sanitary latrine	0.1395
MEMBER	Household size	-0.0686
N15_59YRP	Proportion of 15 - 59 yrs. People in the household	0.2544
PELECTRIC_UN	Proportion of households with access to electricity at union level	0.5335
PLITERATE	Proportion of literate in the household	0.7097
ZL_44	Dummy for zila=44	0.2076
ZL_50	Dummy for zila=50	0.4239
ZL_55	Dummy for zila=55	0.2281
ZL_57	Dummy for zila=57	0.2212

Khulna SMA [STRATUM 11]

Variables	Description of the variables	Estimated Coefficient
Intercept	Constant used in the model	9.8197
CHLD1_4P	Proportion of 1 - 4 yr children in the household	-0.9315
DSP_LIT_1	Spouse of the head of household is literate	-0.5637
DTUBEWATER_1	Household access to tube-well water	-1.511
MEMBER	Household size	-0.3283
MEMBER2	Household size squared	0.0258
N60PLUSP	Proportion of elderly (60+) people in the household	-0.5934
POTH_WATER_UZ	Proportion of households with access to other water	15.7517
_DSP_LIT#1$HD_AGE	Interaction of spouse literate with age of head	0.021

Rajshahi Rural [STRATUM 12]

Variables	Description of the variables	Estimated Coefficient
Intercept	Constant used in the model	7.2713
CHLD0YRP	Proportion of 0 yr, children in the household	-0.992
CHLD1_4P	Proportion of 1 - 4 yr, children in the household	-0.7355
CHLD5_14P	Proportion of 5 -1 4 yr, children in the household	-0.1974
DELECTRIC_1	Household access to electricity	0.1689
DHDNMUSLIM_1	Head of the household is a non-muslim	-0.1644
DSLATRINE_1	Household access to a sanitary latrine	0.158

HD_AGE	Age of the head of household in years	0.0031
HD_EDU	Education grade of the head of household	0.0292
MEMBER	Household size	-0.0403
N15_59YRP	Proportion of 15 - 59 yr. people in the household	0.2591
P11_15MSCHNEW	Proportion of 11 - 15 yr. male children attending school	0.4315
ZL_10	Dummy for zila=10	0.1353
ZL_64	Dummy for zila=64	0.2467
ZL_70	Dummy for zila=70	0.2006

Rajshahi Urban [STRATUM 13]

Variables	**Description of the variables**	**Estimated Coefficient**
Intercept	Constant used in the model	6.1221
CHLD5_14P	Proportion of 5 - 14 yr. children in the household	0.8567
DELECTRIC_1	Household access to electricity	0.2616
DHD_LIT_1	Head of the household is literate	0.651
DJSEC_EDU_1	Head of the household with junior secondary education	-0.5902
DPRI_EDU_1	Head of the household with primary education	-0.5387
DSEC_EDU_1	Head of the household with secondary education	-0.3653
DSP_LIT_1	Spouse of the head of household is literate	0.1154
N15_59YRP	Proportion of 15 - 59 yr. people in the household	1.3953
N60PLUSP	Proportion of elderly (60 +) people in the household	1.2067
ZL_38	Dummy for zila=38	0.2864
ZL_69	Dummy for zila=69	-0.2215
ZL_70	Dummy for zila=70	0.2237
_ZL#038$MEMBER2	Zila=38 and household size squared	-0.0164
_ZL#088$MEMBER2	Zila=88 and household size squared	-0.0046

Rajshahi SMA [STRATUM 14]

Variables	**Description of the variables**	**Estimated Coefficient**
Intercept	Constant used in the model	7.765
CHLD1_4P	Proportion of 1 - 4 yr. children in the household	-0.7448
DNSLATRINE_1	Household access to a non-sanitary latrine	-0.1336
DPUCCA_1	Main house of the household is pucca	0.2769
MEMBER	Household size	-0.1263
_DHSEC_EDU#1$TPE_MFG	Head with higher secondary edu. & total persons in mfg.	0.0003
_DTAP_WATER$DELECTRIC_01	Household not using tap water & access to electricity	0.3542
_HD_AGE$MEMBER2	Interaction of age of head & household size squared	0.0001

Sylhet Rural [STRATUM 15]

Variables	Description of the variables	Estimated Coefficient
Intercept	Constant used in the model	6.9912
CHLD1_4P	Proportion of 1 - 4 yr. children in the household	-0.3627
DELECTRIC_1	Household access to electricity	0.2158
DHDNMUSLIM_1	Head of the household is non-muslim	-0.1818
DHD_LIT_1	Head of the household is literate	0.1221
DNOLATRINE_1	Household with no latrine	-0.1281
DOWNED_HH_1	Household owned the house	0.1456
DPUCCA_1	Main house of the household is pucca	0.264
DRENTED_HH_1	Houshold with a rented house	0.3454
DSP_LIT_1	Spouse of the head is literate	0.1148
HD_AGE	Age of the head of household in years	0.0048
MEMBER	Household size	-0.1564
MEMBER2	Household size squared	0.0077
N15_59YRP	Proportion of 15 - 59 yr. people in the household	0.4352
P11_15FSCHNEW	Proportion of 11 - 15 yr female children attending school	0.8364
P11_15MSCHNEW	Proportion of 11 - 15 yr male children attending school	0.8373
PELECTRIC_M	Mauza level census mean of households with access to ectricity	-0.281
PPUCCA_M	Mauza level census mean of households with pucca house	0.5721
PTUBEWATER_UZ	Upazila level census mean of households using tube-well water	0.5283

Sylhet Urban [STRATUM 16]

Variables	Description of the variables	Estimated Coefficient
Intercept	Constant used in the model	8.1775
CHLD1_4P	Proportion of 1 - 4 yr. children in the household	-1.0735
DGRA_EDU_1	Head of the household is a graduate	0.1811
DHDNMUSLIM_1	Head of the household is a non-muslim	-0.2484
DHD_LIT_1	Head of the household is literate	0.5252
DHSEC_EDU_1	Head of the household with higher secondary education	0.3007
DISABLEP	Proportion of disable person in the household	1.06
DNSLATRINE_1	Household access to non-sanitary latrine	-0.2589
DPGRA_EDU_1	Head of the household is a post graduate	0.3533
MEMBER	Household size	-0.0703

Rangpur Rural [STRATUM 17]

Variables	Description of the variables	Estimated Coefficient
Intercept	Constant used in the model	10.1256
DRENTFREE_1	The house of the household is rent free	-0.1067
HD_EDU	Education grade of the head of household	0.036

MEMBER	Household size	-0.0235
N15_59YRP	Proportion of 15 - 59 yr people in the household	0.6397
N60PLUSP	Proportion of elderly (60 +) people in the household	0.693
P11_15FSCHNEW	Proportion of 11 - 15 yr. female children attending school	0.4768
P11_15MSCHNEW	Proportion of 11 - 15 yr. male children attending school	0.7226
PSEMIPUCCA_UN	Union level census mean of the households with a semi-pucca house	0.883
PTAP_WATER_M	Mauza level census mean of the households with access to tap water	-11.6155
PTUBEWATER_M	Mauza level census mean of the households with access to tube-well water	-3.2322
_ZL#049$DHD_LIT_MEAN_UZ	Zila=49 &upazila level census mean of households with literate head	-0.9172
_ZL$DGRA_EDU_270	Zila=27 & head of the household not a graduate	-0.1687
_ZL$DGRA_EDU_320	Zila=32 & head of the household not a graduate	-0.2286
_ZL$DGRA_EDU_850	Zila=85 & head of the household not a graduate	-0.2053
_ZL$DGRA_EDU_941	Zila=94 & head of the household is a graduate	0.9244

Rangpur Urban [STRATUM 18]

Variables	**Description of the variables**	**Estimated Coefficient**
Intercept	Constant used in the model	6.8095
CHLD1_4P	Proportion of 1 - 4 yr. children in the household	-0.3287
DELECTRIC_1	Household has access to electricity	0.2445
DGRA_EDU_1	Head of the household is a graduate	0.495
DHD_LIT_1	Head of the household is literate	0.1494
DHSEC_EDU_1	Head of the household with higher secondary education	0.1775
DPGRA_EDU_1	Head of the household is a post graduate	0.5013
DPUCCA_1	Main house of the household is pucca	0.1909
DSEC_EDU_1	Head of the household with secondary education	0.1951
DSP_LIT_1	Spouse of the head of household is literate	0.0989
MEMBER	Household size	-0.0486
N15_59YRP	Proportion of 15 -59 yr. children in the household	0.3885
N60PLUSP	Proportion of elderly people (60 +) in the household	0.5888
PELECTRIC_UZ	Upazila level census mean of households with access to electricity	0.5859
ZL_94	Dummy for zila=94	0.2348

Annex3: Standard Errors of the Poverty Estimates

The HIES utilizes a stratified two stage survey design where primary sampling units (PSUs) are selected within each stratum at the 1st stage, following which individual households are randomly selected within each selected PSU at the 2nd stage.APSU is usually a natural cluster of households—i.e. a *Mauza* in rural areas and *Mahalla* in urban areas.

In the Poverty Mapping exercise *Mauza/Mahalla*, which is the lowest administrative unit in Bangladesh, was treated as a cluster.Thisfollows Elbers,Lanjouw, and Lanjouw (ELL), who recommend using the lowest possible administrative unit as cluster for estimation purposes.For comparison purposes, standard errors of poverty estimates derived using the Upazilaas cluster were also computed, and are presented in Table 12. Point estimates of poverty using Upazila as the cluster are in general similar to those estimated with *Mauza/Mahalla* as the cluster, but with higher standard errors.Table 11 presents a comparison of standard errors of the poverty estimates computed using these two different levels of aggregation.

Table 11 :Comparison of standard errors at different level of disaggregation

	Standard Errors of Poverty Estimates (%)					
	Mauza/Mahalla as cluster			**Upazila as cluster**		
Percentile	**Stratum**	**Zila**	**Upazila**	**Stratum**	**Zila**	**Upazila**
Median	1.2	1.8	2.2	1.6	3.1	7.1
95%	1.6	4.5	5.2	3.4	7.3	13.7
Max	1.9	6.2	10.7	4.0	11.2	20.4

Table 12 :Comparison of Poverty Estimates and Standard Errors

Name of Upazila	Poverty Headcount Rate		Standard Error of Estimate	
	Cluster based on Mauza/Mahalla	Cluster based on Upazila	Cluster based on Mauza/Mahalla	Cluster based on Upazila
BAGERHAT SADAR	0.359	0.359	0.014	0.058
CHITALMARI	0.500	0.490	0.019	0.069
FAKIRHAT	0.364	0.358	0.019	0.059
KACHUA	0.425	0.426	0.019	0.075
MOLLAHAT	0.461	0.454	0.023	0.071
MONGLA	0.419	0.422	0.017	0.050
MORRELGANJ	0.465	0.465	0.016	0.063
RAMPAL	0.411	0.405	0.018	0.070
SARANKHOLA	0.480	0.466	0.028	0.087
ALIKADAM	0.429	0.413	0.045	0.124
BANDARBAN SADAR	0.308	0.313	0.024	0.064
LAMA	0.410	0.380	0.031	0.098
NAIKHONGCHHARI	0.460	0.440	0.037	0.114
ROWANGCHHARI	0.329	0.323	0.036	0.100
RUMA	0.423	0.398	0.037	0.100
THANCHI	0.530	0.514	0.042	0.107
AMTALI	0.228	0.205	0.017	0.057
BAMNA	0.171	0.153	0.017	0.045
BARGUNA SADAR	0.192	0.183	0.014	0.049
BETAGI	0.196	0.165	0.016	0.047
PATHARGHATA	0.129	0.127	0.012	0.031
AGAILJHARA	0.511	0.498	0.023	0.075
BABUGANJ	0.487	0.467	0.022	0.081
BAKERGANJ	0.554	0.540	0.019	0.070
BANARI PARA	0.522	0.497	0.023	0.085
GAURNADI	0.555	0.550	0.018	0.062
HIZLA	0.623	0.591	0.021	0.076
BARISAL SADAR (KOTWALI)	0.499	0.511	0.019	0.047
MHENDIGANJ	0.644	0.624	0.021	0.070
MULADI	0.582	0.569	0.022	0.072
WAZIRPUR	0.521	0.513	0.023	0.075
BHOLA SADAR	0.492	0.519	0.030	0.070
BURHANUDDIN	0.283	0.263	0.017	0.064
CHAR FASSON	0.282	0.295	0.021	0.073
DAULAT KHAN	0.303	0.312	0.020	0.059
LALMOHAN	0.278	0.253	0.018	0.063
MANPURA	0.328	0.318	0.027	0.081
TAZUMUDDIN	0.223	0.213	0.024	0.063

Name of Upazila	Poverty Headcount Rate		Standard Error of Estimate	
	Cluster based on Mauza/Mahalla	Cluster based on Upazila	Cluster based on Mauza/Mahalla	Cluster based on Upazila
ADAMDIGHI	0.131	0.121	0.013	0.031
BOGRA SADAR	0.176	0.150	0.008	0.024
DHUNAT	0.198	0.214	0.022	0.061
DHUPCHANCHIA	0.132	0.127	0.014	0.035
GABTALI	0.156	0.156	0.019	0.039
KAHALOO	0.117	0.116	0.015	0.038
NANDIGRAM	0.161	0.161	0.016	0.044
SARIAKANDI	0.216	0.210	0.022	0.053
SHAJAHANPUR	0.125	0.115	0.012	0.032
SHERPUR	0.157	0.152	0.019	0.042
SHIBGANJ	0.169	0.160	0.017	0.043
SONATOLA	0.237	0.228	0.020	0.045
AKHAURA	0.269	0.246	0.023	0.071
BANCHHARAMPUR	0.273	0.260	0.031	0.096
BIJOYNAGAR	0.358	0.337	0.031	0.110
BRAHMANBARIA SADAR	0.260	0.245	0.022	0.066
ASHUGANJ	0.218	0.205	0.033	0.091
KASBA	0.255	0.228	0.025	0.076
NABINAGAR	0.305	0.287	0.028	0.077
NASIRNAGAR	0.437	0.417	0.034	0.101
SARAIL	0.311	0.305	0.035	0.089
CHANDPUR SADAR	0.455	0.414	0.042	0.082
FARIDGANJ	0.466	0.463	0.050	0.100
HAIM CHAR	0.613	0.606	0.056	0.129
HAJIGANJ	0.537	0.509	0.047	0.099
KACHUA	0.563	0.522	0.051	0.137
MATLAB DAKSHIN	0.537	0.515	0.042	0.089
MATLAB UTTAR	0.499	0.509	0.051	0.091
SHAHRASTI	0.505	0.499	0.050	0.119
ANOWARA	0.155	0.166	0.019	0.049
BAYEJID BOSTAMI	0.092	0.083	0.012	0.014
BANSHKHALI	0.279	0.284	0.025	0.084
BAKALIA	0.049	0.042	0.011	0.013
BOALKHALI	0.105	0.100	0.015	0.028
CHANDANAISH	0.135	0.136	0.016	0.046
CHANDGAON	0.169	0.172	0.022	0.022
CHITTAGONG PORT	0.124	0.104	0.020	0.018
DOUBLE MOORING	0.000	0.000	0.000	0.000
FATIKCHHARI	0.176	0.179	0.016	0.067
HALISHAHAR	0.056	0.051	0.010	0.015

Name of Upazila	Poverty Headcount Rate		Standard Error of Estimate	
	Cluster based on Mauza/Mahalla	Cluster based on Upazila	Cluster based on Mauza/Mahalla	Cluster based on Upazila
HATHAZARI	0.011	0.008	0.004	0.004
KOTWALI	0.003	0.001	0.002	0.002
KHULSHI	0.011	0.009	0.004	0.004
LOHAGARA	0.183	0.195	0.021	0.060
MIRSHARAI	0.134	0.152	0.015	0.049
PAHARTALI	0.300	0.312	0.049	0.048
PANCHLAISH	0.008	0.005	0.004	0.005
PATIYA	0.081	0.097	0.011	0.040
PATENGA	0.039	0.031	0.009	0.008
RANGUNIA	0.140	0.149	0.014	0.044
RAOZAN	0.085	0.091	0.009	0.027
SANDWIP	0.191	0.194	0.021	0.057
SATKANIA	0.152	0.155	0.015	0.053
SITAKUNDA	0.115	0.135	0.013	0.040
ALAMDANGA	0.260	0.247	0.036	0.064
CHUADANGA SADAR	0.292	0.267	0.030	0.057
DAMURHUDA	0.271	0.258	0.034	0.074
JIBAN NAGAR	0.291	0.279	0.036	0.080
BARURA	0.379	0.355	0.028	0.094
BRAHMAN PARA	0.399	0.374	0.035	0.119
BURICHANG	0.333	0.321	0.030	0.119
CHANDINA	0.412	0.398	0.030	0.086
CHAUDDAGRAM	0.344	0.340	0.027	0.101
COMILLA SADAR DAKSHIN	0.333	0.335	0.022	0.072
DAUDKANDI	0.385	0.381	0.028	0.099
DEBIDWAR	0.414	0.394	0.027	0.089
HOMNA	0.383	0.374	0.037	0.100
COMILLA ADARSHA SADAR	0.244	0.249	0.017	0.053
LAKSAM	0.374	0.365	0.028	0.094
MANOHARGANJ	0.471	0.464	0.034	0.111
MEGHNA	0.373	0.364	0.042	0.122
MURADNAGAR	0.450	0.439	0.031	0.112
NANGALKOT	0.451	0.448	0.033	0.117
TITAS	0.377	0.375	0.038	0.111
CHAKARIA	0.285	0.268	0.022	0.086
COX'S BAZAR SADAR	0.262	0.259	0.020	0.056
KUTUBDIA	0.311	0.292	0.044	0.103
MAHESHKHALI	0.402	0.382	0.034	0.107
PEKUA	0.309	0.280	0.034	0.096
RAMU	0.343	0.331	0.027	0.093

Name of Upazila	Poverty Headcount Rate		Standard Error of Estimate	
	Cluster based on Mauza/Mahalla	Cluster based on Upazila	Cluster based on Mauza/Mahalla	Cluster based on Upazila
TEKNAF	0.382	0.367	0.034	0.095
UKHIA	0.378	0.351	0.033	0.104
ADABOR	0.125	0.192	0.025	0.080
BADDA	0.134	0.143	0.033	0.067
BANGSHAL	0.094	0.075	0.028	0.053
BIMAN BANDAR	0.013	0.105	0.010	0.052
CANTONMENT	0.015	0.018	0.008	0.018
CHAK BAZAR	0.107	0.101	0.028	0.054
DAKSHINKHAN	0.246	0.165	0.061	0.075
DARUS SALAM	0.142	0.193	0.027	0.081
DEMRA	0.199	0.165	0.043	0.079
DHAMRAI	0.228	0.255	0.018	0.080
DHANMONDI	0.014	0.010	0.006	0.012
DOHAR	0.239	0.284	0.021	0.091
GENDARIA	0.093	0.101	0.027	0.056
GULSHAN	0.033	0.089	0.013	0.049
HAZARIBAGH	0.122	0.131	0.020	0.061
JATRABARI	0.116	0.134	0.029	0.069
KAFRUL	0.070	0.099	0.015	0.053
KADAMTALI	0.150	0.141	0.040	0.063
KALABAGAN	0.101	0.082	0.026	0.051
KAMRANGIR CHAR	0.220	0.201	0.057	0.085
KHILGAON	0.137	0.138	0.028	0.063
KHILKHET	0.147	0.155	0.033	0.076
KERANIGANJ	0.259	0.259	0.035	0.099
KOTWALI	0.059	0.040	0.014	0.037
LALBAGH	0.160	0.142	0.028	0.067
MIRPUR	0.067	0.069	0.014	0.040
MOHAMMADPUR	0.040	0.021	0.015	0.021
MOTIJHEEL	0.013	0.004	0.008	0.007
NAWABGANJ	0.211	0.263	0.021	0.106
NEW MARKET	0.037	0.034	0.017	0.034
PALLABI	0.120	0.122	0.020	0.062
PALTAN	0.027	0.004	0.015	0.006
RAMNA	0.038	0.026	0.012	0.026
RAMPURA	0.102	0.131	0.025	0.063
SABUJBAGH	0.116	0.118	0.027	0.060
SAVAR	0.340	0.289	0.101	0.099
SHAH ALI	0.157	0.159	0.023	0.075
SHAHBAGH	0.015	0.019	0.007	0.020

Name of Upazila	Poverty Headcount Rate		Standard Error of Estimate	
	Cluster based on Mauza/Mahalla	Cluster based on Upazila	Cluster based on Mauza/Mahalla	Cluster based on Upazila
SHYAMPUR	0.129	0.151	0.031	0.064
SHER-E-BANGLA NAGAR	0.077	0.145	0.022	0.065
SUTRAPUR	0.046	0.034	0.011	0.030
TEJGAON	0.053	0.050	0.019	0.033
TEJGAON IND. AREA	0.067	0.119	0.021	0.062
TURAG	0.251	0.196	0.039	0.090
UTTARA	0.037	0.064	0.015	0.036
UTTAR KHAN	0.249	0.160	0.083	0.077
BIRAMPUR	0.359	0.402	0.032	0.111
BIRGANJ	0.431	0.471	0.044	0.156
BIRAL	0.388	0.479	0.049	0.153
BOCHAGANJ	0.384	0.428	0.044	0.124
CHIRIRBANDAR	0.385	0.477	0.043	0.146
FULBARI	0.338	0.426	0.041	0.109
GHORAGHAT	0.418	0.483	0.036	0.126
HAKIMPUR	0.389	0.382	0.031	0.112
KAHAROLE	0.443	0.476	0.049	0.136
KHANSAMA	0.465	0.474	0.058	0.153
DINAJPUR SADAR	0.282	0.335	0.021	0.097
NAWABGANJ	0.373	0.466	0.045	0.157
PARBATIPUR	0.397	0.430	0.040	0.138
ALFADANGA	0.299	0.342	0.023	0.106
BHANGA	0.335	0.378	0.018	0.086
BOALMARI	0.393	0.427	0.017	0.080
CHAR BHADRASAN	0.358	0.382	0.047	0.078
FARIDPUR SADAR	0.383	0.398	0.042	0.070
MADHUKHALI	0.305	0.357	0.022	0.089
NAGARKANDA	0.359	0.379	0.022	0.089
SADARPUR	0.369	0.392	0.025	0.084
SALTHA	0.421	0.438	0.029	0.086
CHHAGALNAIYA	0.259	0.213	0.026	0.069
DAGANBHUIYAN	0.163	0.259	0.028	0.081
FENI SADAR	0.186	0.230	0.022	0.065
FULGAZI	0.318	0.253	0.031	0.089
PARSHURAM	0.306	0.244	0.025	0.067
SONAGAZI	0.445	0.375	0.032	0.096
FULCHHARI	0.581	0.637	0.053	0.143
GAIBANDHA SADAR	0.448	0.490	0.041	0.146
GOBINDAGANJ	0.454	0.506	0.036	0.144
PALASHBARI	0.448	0.543	0.042	0.144

Name of Upazila	Poverty Headcount Rate		Standard Error of Estimate	
	Cluster based on Mauza/Mahalla	Cluster based on Upazila	Cluster based on Mauza/Mahalla	Cluster based on Upazila
SADULLAPUR	0.510	0.522	0.046	0.162
SAGHATA	0.528	0.537	0.043	0.143
SUNDARGANJ	0.476	0.546	0.050	0.145
GAZIPUR SADAR	0.221	0.226	0.107	0.073
KALIAKAIR	0.110	0.137	0.022	0.041
KALIGANJ	0.157	0.144	0.019	0.054
KAPASIA	0.270	0.188	0.021	0.077
SREEPUR	0.144	0.160	0.023	0.046
GOPALGANJ SADAR	0.411	0.429	0.021	0.071
KASHIANI	0.391	0.424	0.021	0.092
KOTALIPARA	0.436	0.432	0.023	0.080
MUKSUDPUR	0.465	0.483	0.020	0.091
TUNGIPARA	0.426	0.439	0.026	0.080
AJMIRIGANJ	0.326	0.319	0.019	0.082
BAHUBAL	0.241	0.291	0.016	0.089
BANIACHONG	0.276	0.308	0.015	0.096
CHUNARUGHAT	0.275	0.278	0.014	0.069
HABIGANJ SADAR	0.169	0.186	0.011	0.050
LAKHAI	0.252	0.293	0.020	0.086
MADHABPUR	0.259	0.255	0.014	0.072
NABIGANJ	0.268	0.261	0.014	0.066
AKKELPUR	0.269	0.273	0.011	0.046
JOYPURHAT SADAR	0.260	0.259	0.010	0.045
KALAI	0.256	0.259	0.013	0.043
KHETLAL	0.261	0.263	0.015	0.052
PANCHBIBI	0.283	0.277	0.013	0.051
BAKSHIGANJ	0.504	0.493	0.029	0.102
DEWANGANJ	0.585	0.556	0.033	0.089
ISLAMPUR	0.550	0.503	0.023	0.076
JAMALPUR SADAR	0.498	0.494	0.024	0.072
MADARGANJ	0.555	0.553	0.020	0.075
MELANDAHA	0.472	0.450	0.016	0.089
SARISHABARI UPAZILA	0.447	0.438	0.018	0.080
ABHAYNAGAR	0.360	0.361	0.017	0.056
BAGHER PARA	0.425	0.430	0.020	0.084
CHAUGACHHA	0.428	0.443	0.018	0.087
JHIKARGACHHA	0.389	0.390	0.020	0.075
KESHABPUR	0.420	0.433	0.017	0.071
JESSORE SADAR	0.353	0.333	0.013	0.057
MANIRAMPUR	0.402	0.391	0.019	0.077

Name of Upazila	Poverty Headcount Rate		Standard Error of Estimate	
	Cluster based on Mauza/Mahalla	Cluster based on Upazila	Cluster based on Mauza/Mahalla	Cluster based on Upazila
SHARSHA	0.408	0.404	0.018	0.072
JHALOKATI SADAR	0.377	0.363	0.023	0.064
KANTHALIA	0.342	0.371	0.029	0.079
NALCHITY	0.465	0.460	0.020	0.066
RAJAPUR	0.420	0.419	0.024	0.069
HARINAKUNDA	0.260	0.254	0.022	0.056
JHENAIDAH SADAR	0.239	0.228	0.018	0.054
KALIGANJ	0.240	0.221	0.019	0.056
KOTCHANDPUR	0.202	0.214	0.016	0.045
MAHESHPUR	0.236	0.230	0.022	0.064
SHAILKUPA	0.282	0.279	0.020	0.059
DIGHINALA	0.225	0.226	0.034	0.091
KHAGRACHHARI SADAR	0.195	0.164	0.020	0.058
LAKSHMICHHARI	0.310	0.317	0.035	0.107
MAHALCHHARI	0.214	0.192	0.033	0.096
MANIKCHHARI	0.301	0.271	0.046	0.109
MATIRANGA	0.283	0.268	0.028	0.092
PANCHHARI	0.234	0.214	0.040	0.097
RAMGARH	0.326	0.273	0.033	0.080
BATIAGHATA	0.405	0.402	0.016	0.063
DACOPE	0.445	0.443	0.019	0.071
DAULATPUR	0.345	0.258	0.020	0.066
DUMURIA	0.372	0.381	0.016	0.069
DIGHALIA	0.393	0.379	0.024	0.066
KHALISHPUR	0.411	0.255	0.026	0.058
KHAN JAHAN ALI	0.319	0.277	0.028	0.063
KHULNA SADAR	0.355	0.216	0.021	0.061
KOYRA	0.491	0.494	0.021	0.080
PAIKGACHHA	0.424	0.421	0.017	0.068
PHULTALA	0.337	0.328	0.025	0.060
RUPSA	0.369	0.372	0.015	0.068
SONADANGA	0.193	0.205	0.023	0.057
TEROKHADA	0.496	0.488	0.026	0.070
AUSTAGRAM	0.337	0.281	0.034	0.070
BAJITPUR	0.282	0.236	0.026	0.064
BHAIRAB	0.339	0.287	0.022	0.055
HOSSAINPUR	0.330	0.279	0.034	0.061
ITNA	0.349	0.300	0.034	0.082
KARIMGANJ	0.271	0.251	0.027	0.079
KATIADI	0.316	0.287	0.029	0.079

Name of Upazila	Poverty Headcount Rate		Standard Error of Estimate	
	Cluster based on Mauza/Mahalla	Cluster based on Upazila	Cluster based on Mauza/Mahalla	Cluster based on Upazila
KISHOREGANJ SADAR	0.276	0.248	0.022	0.061
KULIAR CHAR	0.327	0.306	0.033	0.057
MITHAMAIN	0.352	0.328	0.038	0.098
NIKLI	0.300	0.261	0.038	0.082
PAKUNDIA	0.261	0.242	0.024	0.058
TARAIL	0.261	0.242	0.033	0.073
BHURUNGAMARI	0.651	0.635	0.052	0.191
CHAR RAJIBPUR	0.688	0.681	0.057	0.168
CHILMARI	0.611	0.685	0.050	0.154
PHULBARI	0.685	0.656	0.056	0.204
KURIGRAM SADAR	0.580	0.593	0.035	0.130
NAGESHWARI	0.650	0.669	0.040	0.146
RAJARHAT	0.677	0.683	0.066	0.196
RAUMARI	0.570	0.646	0.049	0.181
ULIPUR	0.653	0.667	0.048	0.169
BHERAMARA	0.034	0.028	0.008	0.017
DAULATPUR	0.040	0.035	0.009	0.021
KHOKSA	0.047	0.054	0.008	0.024
KUMARKHALI	0.040	0.035	0.008	0.020
KUSHTIA SADAR	0.030	0.027	0.005	0.015
MIRPUR	0.033	0.029	0.007	0.019
KAMALNAGAR	0.187	0.341	0.040	0.102
LAKSHMIPUR SADAR	0.456	0.240	0.047	0.068
ROYPUR	0.167	0.250	0.022	0.066
RAMGANJ	0.214	0.237	0.022	0.053
RAMGATI	0.304	0.355	0.038	0.079
ADITMARI	0.360	0.370	0.029	0.128
HATIBANDHA	0.381	0.347	0.033	0.129
KALIGANJ	0.353	0.324	0.030	0.123
LALMONIRHAT SADAR	0.313	0.331	0.021	0.116
PATGRAM	0.333	0.394	0.025	0.116
KALKINI	0.332	0.349	0.019	0.096
MADARIPUR SADAR	0.350	0.351	0.019	0.090
RAJOIR	0.314	0.334	0.025	0.102
SHIB CHAR	0.388	0.390	0.021	0.110
MAGURA SADAR	0.430	0.421	0.012	0.054
MOHAMMADPUR	0.508	0.508	0.016	0.070
SHALIKHA	0.442	0.448	0.015	0.067
DAULATPUR	0.294	0.297	0.039	0.094
GHIOR	0.137	0.159	0.024	0.071

Name of Upazila	Poverty Headcount Rate		Standard Error of Estimate	
	Cluster based on Mauza/Mahalla	Cluster based on Upazila	Cluster based on Mauza/Mahalla	Cluster based on Upazila
SREEPUR	0.450	0.437	0.019	0.078
HARIRAMPUR	0.181	0.177	0.030	0.073
MANIKGANJ SADAR	0.187	0.185	0.029	0.067
SATURIA	0.150	0.152	0.027	0.072
SHIBALAYA	0.158	0.166	0.027	0.065
SINGAIR	0.181	0.184	0.025	0.052
GANGNI	0.158	0.175	0.020	0.054
MUJIB NAGAR	0.136	0.135	0.023	0.051
MEHERPUR SADAR	0.151	0.176	0.018	0.048
BARLEKHA	0.257	0.221	0.015	0.066
JURI	0.363	0.290	0.021	0.073
KAMALGANJ	0.267	0.264	0.014	0.067
KULAURA	0.281	0.228	0.016	0.064
MAULVIBAZAR SADAR	0.167	0.185	0.010	0.064
RAJNAGAR	0.223	0.245	0.013	0.084
SREEMANGAL	0.293	0.274	0.014	0.066
GAZARIA	0.268	0.290	0.023	0.066
LOHAJANG	0.336	0.323	0.031	0.096
MUNSHIGANJ SADAR	0.308	0.289	0.020	0.068
SERAJDIKHAN	0.288	0.262	0.023	0.087
SREENAGAR	0.263	0.264	0.027	0.097
TONGIBARI	0.251	0.263	0.024	0.078
BHALUKA	0.311	0.343	0.024	0.110
DHOBAURA	0.582	0.575	0.034	0.105
FULBARIA	0.526	0.514	0.036	0.107
GAFFARGAON	0.439	0.487	0.024	0.116
GAURIPUR	0.506	0.516	0.030	0.093
HALUAGHAT	0.503	0.538	0.025	0.126
ISHWARGANJ	0.560	0.549	0.029	0.092
MYMENSINGH SADAR	0.523	0.503	0.057	0.081
MUKTAGACHHA	0.433	0.466	0.021	0.095
NANDAIL	0.607	0.595	0.048	0.092
PHULPUR	0.588	0.588	0.023	0.102
TRISHAL	0.478	0.482	0.026	0.110
ATRAI	0.135	0.147	0.013	0.039
BADALGACHHI	0.150	0.161	0.012	0.047
DHAMOIRHAT	0.179	0.190	0.012	0.041
NAOGAON SADAR	0.174	0.205	0.009	0.028
NIAMATPUR	0.194	0.201	0.013	0.046
PATNITALA	0.186	0.197	0.012	0.041

Name of Upazila	Poverty Headcount Rate		Standard Error of Estimate	
	Cluster based on Mauza/Mahalla	Cluster based on Upazila	Cluster based on Mauza/Mahalla	Cluster based on Upazila
PORSHA	0.217	0.226	0.017	0.051
MANDA	0.147	0.149	0.013	0.044
MAHADEBPUR	0.156	0.163	0.013	0.048
RANINAGAR	0.133	0.139	0.013	0.043
SAPAHAR	0.214	0.217	0.016	0.048
KALIA	0.233	0.217	0.022	0.055
LOHAGARA	0.199	0.216	0.020	0.061
NARAIL SADAR	0.173	0.155	0.018	0.039
ARAIHAZAR	0.344	0.355	0.024	0.074
SONARGAON	0.213	0.224	0.012	0.070
BANDAR	0.209	0.343	0.036	0.104
NARAYANGANJ SADAR	0.279	0.312	0.052	0.102
RUPGANJ	0.225	0.246	0.013	0.050
BELABO	0.219	0.188	0.035	0.068
MANOHARDI	0.227	0.204	0.029	0.069
NARSINGDI SADAR	0.228	0.225	0.028	0.061
PALASH	0.222	0.185	0.024	0.038
ROYPURA	0.294	0.267	0.032	0.081
SHIBPUR	0.189	0.166	0.031	0.056
BAGATIPARA	0.316	0.313	0.023	0.056
BARAIGRAM	0.361	0.365	0.018	0.051
GURUDASPUR	0.370	0.378	0.018	0.056
LALPUR	0.357	0.367	0.017	0.053
NATORE SADAR	0.318	0.320	0.019	0.045
SINGRA	0.378	0.374	0.015	0.052
BHOLAHAT	0.208	0.221	0.021	0.061
GOMASTAPUR	0.261	0.272	0.020	0.054
NACHOLE	0.242	0.250	0.018	0.048
CHAPAI NABABGANJ SADAR	0.254	0.264	0.016	0.048
SHIBGANJ	0.260	0.264	0.021	0.053
ATPARA	0.316	0.355	0.038	0.105
BARHATTA	0.352	0.369	0.041	0.108
DURGAPUR	0.302	0.382	0.049	0.083
KHALIAJURI	0.372	0.409	0.043	0.101
KALMAKANDA	0.376	0.392	0.040	0.105
KENDUA	0.409	0.379	0.042	0.079
PURBADHALA	0.354	0.351	0.038	0.084
DIMLA	0.352	0.361	0.031	0.147
DOMAR	0.313	0.360	0.025	0.113
JALDHAKA	0.435	0.427	0.027	0.120

Name of Upazila	Poverty Headcount Rate		Standard Error of Estimate	
	Cluster based on Mauza/Mahalla	Cluster based on Upazila	Cluster based on Mauza/Mahalla	Cluster based on Upazila
KISHOREGANJ	0.309	0.360	0.027	0.122
MADAN	0.416	0.415	0.042	0.084
MOHANGANJ	0.343	0.368	0.035	0.078
NETROKONA SADAR	0.308	0.312	0.030	0.084
NILPHAMARI SADAR	0.364	0.341	0.023	0.125
SAIDPUR	0.277	0.279	0.017	0.062
BEGUMGANJ	0.059	0.088	0.009	0.037
CHATKHIL	0.048	0.070	0.008	0.027
COMPANIGANJ	0.076	0.113	0.014	0.042
HATIYA	0.160	0.193	0.025	0.079
KABIRHAT	0.124	0.156	0.018	0.058
SENBAGH	0.054	0.085	0.010	0.039
SONAIMURI	0.050	0.081	0.008	0.032
SUBARNACHAR	0.187	0.228	0.025	0.088
NOAKHALI SADAR	0.102	0.128	0.014	0.047
ATGHARIA	0.312	0.318	0.013	0.052
BERA	0.394	0.389	0.013	0.043
BHANGURA	0.335	0.325	0.011	0.051
CHATMOHAR	0.314	0.311	0.013	0.061
FARIDPUR	0.315	0.318	0.017	0.043
ISHWARDI	0.262	0.260	0.012	0.041
PABNA SADAR	0.278	0.286	0.011	0.045
SANTHIA	0.331	0.334	0.011	0.055
SUJANAGAR	0.354	0.353	0.012	0.058
ATWARI	0.241	0.290	0.024	0.106
BODA	0.266	0.295	0.021	0.110
DEBIGANJ	0.342	0.364	0.025	0.129
PANCHAGARH SADAR	0.242	0.305	0.023	0.107
TENTULIA	0.215	0.298	0.026	0.129
BAUPHAL	0.240	0.219	0.014	0.056
DASHMINA	0.218	0.204	0.020	0.068
DUMKI	0.220	0.225	0.019	0.052
GALACHIPA	0.260	0.237	0.016	0.058
KALA PARA	0.203	0.216	0.018	0.052
MIRZAGANJ	0.178	0.140	0.016	0.047
PATUAKHALI SADAR	0.369	0.395	0.024	0.071
NAZIRPUR	0.515	0.531	0.026	0.077
PIROJPUR SADAR	0.427	0.427	0.017	0.047
NESARABAD (SWARUPKATI)	0.433	0.445	0.020	0.074
ZIANAGAR	0.491	0.504	0.025	0.064

Name of Upazila	Poverty Headcount Rate		Standard Error of Estimate	
	Cluster based on Mauza/Mahalla	Cluster based on Upazila	Cluster based on Mauza/Mahalla	Cluster based on Upazila
BAGHA	0.336	0.364	0.011	0.039
BHANDARIA	0.420	0.433	0.023	0.067
KAWKHALI	0.522	0.536	0.022	0.075
MATHBARIA	0.380	0.389	0.026	0.072
BAGHMARA	0.294	0.309	0.011	0.049
BOALIA	0.241	0.173	0.019	0.035
CHARGHAT	0.314	0.335	0.012	0.042
DURGAPUR	0.257	0.275	0.013	0.044
GODAGARI	0.441	0.460	0.010	0.056
MATIHAR	0.333	0.288	0.027	0.062
MOHANPUR	0.249	0.268	0.013	0.058
PABA	0.334	0.316	0.012	0.046
PUTHIA	0.268	0.284	0.013	0.047
RAJPARA	0.244	0.185	0.020	0.037
SHAH MAKHDUM	0.309	0.263	0.024	0.045
TANORE	0.357	0.393	0.010	0.044
BALIAKANDI	0.397	0.322	0.029	0.117
GOALANDA	0.505	0.421	0.032	0.094
KALUKHALI	0.396	0.315	0.032	0.110
PANGSHA	0.457	0.384	0.025	0.092
RAJBARI SADAR	0.387	0.321	0.024	0.090
BAGHAICHHARI	0.248	0.223	0.037	0.096
BARKAL	0.261	0.221	0.037	0.108
KAWKHALI (BETBUNIA)	0.234	0.199	0.037	0.094
BELAI CHHARI	0.347	0.333	0.064	0.128
KAPTAI	0.122	0.113	0.027	0.059
JURAI CHHARI	0.193	0.177	0.042	0.080
LANGADU	0.293	0.303	0.038	0.122
NANIARCHAR	0.212	0.194	0.033	0.094
RAJASTHALI	0.205	0.196	0.039	0.086
RANGAMATI SADAR	0.073	0.075	0.014	0.037
BADARGANJ	0.483	0.495	0.032	0.122
GANGACHARA	0.583	0.520	0.040	0.113
KAUNIA	0.450	0.503	0.026	0.096
RANGPUR SADAR	0.371	0.382	0.017	0.078
MITHA PUKUR	0.454	0.489	0.030	0.138
PIRGACHHA	0.497	0.483	0.038	0.152
PIRGANJ	0.469	0.517	0.038	0.135
TARAGANJ	0.524	0.507	0.040	0.135
BHEDARGANJ	0.563	0.493	0.062	0.104

Name of Upazila	Poverty Headcount Rate		Standard Error of Estimate	
	Cluster based on Mauza/Mahalla	Cluster based on Upazila	Cluster based on Mauza/Mahalla	Cluster based on Upazila
DAMUDYA	0.479	0.406	0.058	0.111
GOSAIRHAT	0.583	0.534	0.061	0.105
NARIA	0.481	0.419	0.053	0.098
SHARIATPUR SADAR	0.498	0.445	0.049	0.095
ZANJIRA	0.540	0.452	0.057	0.110
ASSASUNI	0.484	0.477	0.016	0.066
DEBHATA	0.431	0.425	0.023	0.062
KALAROA	0.460	0.450	0.013	0.056
KALIGANJ	0.480	0.483	0.014	0.062
SATKHIRA SADAR	0.431	0.431	0.013	0.051
SHYAMNAGAR	0.502	0.498	0.016	0.054
TALA	0.452	0.447	0.015	0.063
BELKUCHI	0.425	0.423	0.013	0.051
CHAUHALI	0.455	0.458	0.015	0.066
KAMARKHANDA	0.325	0.326	0.015	0.059
KAZIPUR	0.362	0.368	0.014	0.057
ROYGANJ	0.394	0.399	0.012	0.064
SHAHJADPUR	0.418	0.414	0.012	0.062
SIRAJGANJ SADAR	0.367	0.364	0.010	0.043
TARASH	0.358	0.370	0.014	0.061
ULLAH PARA	0.366	0.361	0.012	0.050
JHENAIGATI	0.369	0.411	0.030	0.101
NAKLA	0.468	0.484	0.023	0.076
NALITABARI	0.418	0.455	0.022	0.091
SHERPUR SADAR	0.558	0.516	0.024	0.074
SREEBARDI	0.491	0.476	0.024	0.104
BISHWAMBARPUR	0.304	0.351	0.025	0.099
CHHATAK	0.236	0.257	0.012	0.064
DAKSHIN SUNAMGANJ	0.244	0.299	0.017	0.087
DERAI	0.262	0.323	0.016	0.085
DHARAMPASHA	0.255	0.352	0.022	0.102
DOWARABAZAR	0.299	0.308	0.019	0.093
JAGANNATHPUR	0.210	0.268	0.014	0.070
JAMALGANJ	0.246	0.329	0.021	0.097
SULLA	0.283	0.362	0.023	0.098
SUNAMGANJ SADAR	0.251	0.282	0.014	0.072
TAHIRPUR	0.312	0.388	0.022	0.110
BALAGANJ	0.197	0.180	0.013	0.066
BEANI BAZAR	0.159	0.155	0.010	0.051
BISHWANATH	0.125	0.164	0.012	0.059

Name of Upazila	Poverty Headcount Rate		Standard Error of Estimate	
	Cluster based on Mauza/Mahalla	Cluster based on Upazila	Cluster based on Mauza/Mahalla	Cluster based on Upazila
COMPANIGANJ	0.345	0.354	0.021	0.102
DAKSHIN SURMA	0.103	0.133	0.010	0.050
FENCHUGANJ	0.169	0.182	0.017	0.062
GOLAPGANJ	0.149	0.161	0.012	0.057
GOWAINGHAT	0.526	0.354	0.035	0.088
JAINTIAPUR	0.347	0.279	0.020	0.081
KANAIGHAT	0.458	0.245	0.041	0.070
SYLHET SADAR	0.143	0.149	0.007	0.028
ZAKIGANJ	0.390	0.250	0.032	0.074
BASAIL	0.197	0.168	0.018	0.072
BHUAPUR	0.344	0.291	0.014	0.071
DELDUAR	0.243	0.205	0.016	0.069
DHANBARI	0.370	0.305	0.018	0.075
GHATAIL	0.287	0.246	0.015	0.077
GOPALPUR	0.293	0.261	0.014	0.069
KALIHATI	0.235	0.241	0.017	0.078
MADHUPUR	0.364	0.304	0.016	0.082
MIRZAPUR	0.267	0.252	0.020	0.073
NAGARPUR	0.399	0.313	0.015	0.094
SAKHIPUR	0.260	0.219	0.023	0.068
TANGAIL SADAR	0.317	0.270	0.026	0.060
BALIADANGI	0.265	0.298	0.034	0.132
HARIPUR	0.297	0.345	0.035	0.135
PIRGANJ	0.233	0.296	0.029	0.110
RANISANKAIL	0.258	0.324	0.035	0.118
THAKURGAON SADAR	0.286	0.267	0.020	0.112

Annex 4. Results of Multi-Layer Analysis

Table13 bellow presents the results of a multi-layer analysis done with multilevel mixed-effects linear regression using the STATA command XTMIXED. The objective of this analysis is to see impact of the errors at the union and upazila levels. The table shows the shares of variance of errors by stratum at different levels of clustering. The table clearly indicates that most of the errors (more than 95%) are concentrated at the layers or levels of household and mauza and PovMap2 (software used for poverty mapping) can take explicit account of these two levels of errors.

Table 13 :Shares of Variance of errors in each layer (%)

	Three layers model					Two layers model				One layer model		
Stratum	UZ	UN	MZA	HH	All	UZ	MZA	HH	All	MZA	HH	All
Barisal (Rural)	3	0	0	97	100	3	0	97	100	3	97	100
Barisal (Urban)	0	2	2	96	100	0	4	96	100	4	96	100
Chittagong (Rural)	7	0	0	93	100	7	0	93	100	7	93	100
Chittagong (Urban)	0	1	1	98	100	0	3	97	100	3	97	100
Chittagong (SMA)	0	1	1	98	100	0	2	98	100	2	98	100
Dhaka (Rural)	1	3	4	92	100	1	7	92	100	8	92	100
Dhaka (Urban)	0	2	2	96	100	0	4	96	100	4	96	100
Dhaka (SMA)	**Not Converging**											
Khulna (Rural)	2	1	1	96	100	2	2	96	100	4	96	100
Khulna (Urban)	0	0	1	99	100	0	1	99	100	1	99	100
Khulna (SMA)	0	1	1	98	100	0	2	98	100	2	98	100
Rajshahi (Rural)	0	2	2	96	100	0	3	97	100	3	97	100
Rajshahi (Urban)	0	2	2	96	100	0	3	97	100	3	97	100
Rajshahi (SMA)	0	2	2	96	100	0	4	96	100	4	96	100
Sylhet (Rural)	0	2	2	96	100	0	4	96	100	4	96	100
Sylhet (Urban)	0	1	1	98	100	0	2	98	100	2	98	100
Rangpur (Rural)	0	4	3	93	100	0	7	93	100	7	93	100
Rangpur (Urban)	2	2	2	94	100	2	4	94	100	6	94	100

Annex 5: Detailed Methodology on SAE

Box 1: The Small Area Estimation Method Developed by ELL (2003)

The method proposed by ELL has two stages. In the first part, a model of log per capita consumption expenditure ($\ln y_{ch}$) is estimated in the survey 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 disturbances due to the discrepancy between the predicted household consumption and the actual value. This disturbance term is decomposed into two independent components: $u_{ch} = \eta_c + \varepsilon_{ch}$ where a cluster-specific effect, η_c and a household-specific effect, ε_{ch}. 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 – *Zila, Upazila*, Union, *Mauza*, and Village – and can be drawn from any data sources that include all locations in the country. All parameters regarding the regression coefficients (β, γ)and distributions of the disturbance terms are estimated by Feasible Generalized Least Square (FGLS). In the second part of the analysis, poverty estimates and their standard errors are computed. There are two sources of errors involved in the estimation process: errors in the estimated regression coefficients ($\hat{\beta}$, $\hat{\gamma}$) and the disturbance terms, both of which affect poverty estimates and the level of their accuracy. ELL propose a way to properly calculate poverty estimates as well as their standard errors while taking into account these sources of bias. A simulated value of expenditure 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 the disturbance terms, η_c and ε_{ch}. These simulations are repeated 100 times. For any given location (such as a *zila* or an *upazila*), the mean across the 100 simulations of a poverty statistic provides a point estimate of the statistic, and the standard deviation provides an estimate of the standard error.