Relative Prevalance of Poverty at Upazila Level in Selected Districts
Findings from Perception Survey based on Pair-wise Comparison

30 May 2014

Submitted to

World Food Programme (WFP)

Submitted by

List of Acronyms

BBS	Bangladesh Bureau of Statistics
WB	World Bank
HIES	Household Income Expenditure Survey
CBN	Consumption of Basic Needs
WFP	World Food Programme
NGO	Non-Government Organization
UN	United Nations
UNO	Upazila Nirbahi Officer
CV	Coefficient of variation
ERG	Economic Research Group

Relative Prevalance of Poverty at Upazila Level in Selected Districts
Findings from Perception Survey based on Pair-wise Comparison

1. Introduction

The objective of the study was to measure relative prevalence of poverty at upazila levels in several districts in Bangladesh, drawing upon perception-based responses of selected groups of locals in each of the selected districts.

Statistically valid poverty estimates for divisions and zone-levels, using data from 2010 Household Income Expenditure Survey (HIES), have already been published by the Bangladesh Bureau of Statistics (BBS). The research team is informed that an independent poverty mapping exercise[1] by the BBS, the World Bank (WB), and the World Food Programme (WFP) preceded the current initiative. The exercise reportedly used data from 2010 Household Income Expenditure Survey (HIES) and the 2011 Population Census to arrive at zila (district) and upazila-level poverty (both upper and lower) estimates by applying Small Area Estimation (SAE) technique.

The Perception Survey of ERG, covering 16 districts across Bangladesh, was commissioned by WFP.[2] Other than the use of the district-level estimates from the SAE based Poverty Mapping exercise, made available by WFP for drawing the sample districts, the current exercise refrains from being influenced by the upazila-level estimates that the BBS-WB-WFP may have arrived at. It also needs mentioning that upazila poverty rankings, captured through perceived percentages (of poverty) are valid for relative assessments within respective districts only; and no attempt should be made to compare poverty levels across districts.

The first part of this report (Sections 2 to 4) looks into the following broad areas:
- What does a perception survey involve?
- Perception on what? Whose perception?
- How best to find quantitative representation of the perceptions so that relative poverty status of upazilas in a district may be mapped onto a single scale?
- Criterion and choice of sample districts, along with an outline of survey methods.

The second part presents the findings of the perception survey and draws lessons from field surveys. Field observations presented generally reflect on appropriateness (or, inappropriateness) of perception-based measures. Efforts are made to interpret the findings and highlight the SAE based poverty estimates at district levels. In the absence of technical details of the estimates and

---

[1] The poverty estimates in Bangladesh are computed by the BBS from the HIES at the national and division-level only due to the limited sample size of the survey. BBS, WB and WFP have historically partnered to produce poverty estimates at sub-division level using data from HIES and Population Census.

[2] A similar study was commissioned by WFP after the exercise for the production of 2005 Poverty Maps. The study is referred to as Hassan and Hassan, 2008 throughout this report.

their upazila level estimates, no assessment may be made on the latter. Some of the details on methods and sampling are relegated to Annex 1.

2. Observations on Perceptions and Perception Surveys

When information is scanty and collection of details to arrive at some objective numerical measure of poverty is costly, perception surveys provide an alternative. While perceptions of relevant people are important on their own merit, those may not necessarily have close correspondence with objective measures that are meant to be proxied (indirectly measured). Strictly speaking, the two are not close substitutes. Since there is no *a prior* analytical frame to tie the two measures, one is unable to rank the two on a single dimension of statistical acceptability. Nor is it possible to identify a set of criteria to make the choice between the two. *At the most, researchers (involved in small area estimation exercise) may derive some comfort if the two measures converge, and may be encouraged to dig deep to explain (and look for better specification for quantitative measures) if there are gross deviations. It is important to take note of this limitation so that interpretations of findings are accordingly made.*

An income and expenditure-based measure of poverty is alleged to be 'objective' since the data generated are independent of one's wishes. The latter assertion presumes that the data fulfills other requirements for data quality.

One may however argue that human biases work through our definition of 'poverty' and 'poor', and in the choice of thresholds that differentiate between 'poverty' and 'no-poverty'. As such, there is no one 'perception-based measure of poverty' – one may however obtain information on perceptions about poverty level prevailing at a place during a given time, and among specific individuals/communities identified a prior. Thus, it is important to ensure that respondents' understanding of poverty is at par with that of the researchers, and 'right kind of' people are consulted to arrive at figures that are possibly close to the objective measures. *Fortunately, as will be further revealed in the process, the present study emphasizes on relative ranking of upazilas in '(income) poverty scale', and recognizes the limitations of drawing firm conclusion on perceived poverty prevalence expressed in numbers.*

3. Which poverty and whose perception?

Which poverty?

Under the currently practiced CBN (Consumption of Basic Needs) method, both lower and upper level poverty measures are produced[3]. It applies to small area estimation of poverty at sub-

---

[3] The lower and upper poverty (income) lines are arrived at by adding two different allowances for non-food consumption to the cost of a fixed food bundle, where the latter is presumed to provide minimal nutritional requirements corresponding to 2,122 kcal per day per persons is estimated. In the first case, the median amount spent for non-food items by a group of households whose per capita **total expenditure** is close to the food poverty line, is considered and is called the "lower poverty line". In the second case, the median amount spent for non-food items by a group of households whose per capita food expenditure is close to the food poverty line, is considered and is called the "upper poverty line".

national levels as well. It is therefore important to clearly identify the poverty measure corresponding to which perceptions are being obtained. The earlier study (Hassan & Hassan 2008) remained ambiguous regarding the choice of poverty measure. However, the operational definition to convey to the respondents suggests that the lower poverty measure, with emphasis on chronic poverty, and often interchangeably used with extreme poverty, had been under focus.[4] It was proposed during the consultation meeting at the BBS[5] *that the perception survey adheres to one measure of poverty, and it should ideally be the lower poverty* due to the following three main reasons.

- Even though exact comparison with previous perception survey may be difficult, one would find a current measure based on lower poverty more suitable than one based on upper poverty.
- Since lower poverty is measured in terms of the money value of a consumption basket that includes the basic needs, and the latter is commonly understood by most with least variability; one is more likely to capture perception in quantities that are comparable across space (districts) and across (respondent) groups within each district.
- Increasingly, the focus of safety net programmes in the country has been on extreme (and chronic) poor; and their spatial distribution is better captured by the measure of lower poverty.

For the purpose of the field survey, families not having access to or the ability to earn and purchase adequate food required to meet minimum nutritional needs of its members were considered poor.

Who are the respondents?

The conventional perception surveys aim at capturing respondents' choices within a set of goods and services, or their opinions on (or, characteristics of) specific activities or events. In such cases, the findings are objectives and capture distribution of a target population across preset options with some probability of error, as it is in cases of opinion polls.

Perception surveys for obtaining a poverty figure for an upazila have no such basis. Instead, the purpose is to obtain the best guess by consulting appropriate groups of key informants. To be consistent with the previous design, we consider three such groups who are expected to be resident in the respective district for at least two years and are informed about the livelihood status of people in different upazilas in their districts:

Group1: Local government body & local people: Upazila chairman, members or local elites, educationist who are long residents of these areas and have knowledge on the food security of the upazilas in the selected district.

---

[4] Conditions were identified that represented a household or individual's inability to meet the basic needs, frequently (and) over longer period of time. "Basic needs include adequate food water, clothing, shelter, health and basic education. "Chronic" poverty refers to deprivation that is long term by nature."

[5] The meeting held on 16th March 2014 was attended by representatives from BBS, WB and WFP. A presentation was made by ERG researcher.

Group 2: Government officials: PIOs, District/Upazila health officer, education officer, fisheries officer, women affairs' officer, UNOs, BBS officers at district levels, officials of Department of Agriculture Extension, etc.

Group 3: NGO workers, UN field officers, and other community workers.

4. Choice of Sample of Districts

Given the purpose of the survey, the choice of districts was constrained by availability of data that would permit identifying odd characteristics in various measures of poverty. The following sets of data were reportedly available with the WFP for undertaking the exercises:
- District level estimates of upper level poverty, 2005 & 2010
- Upazila level estimates for both upper and lower level poverty, 2005 & 2010
- Perceptions of practitioners as reflected in WFP choice

Districts are the sampling units, and the purpose was to identify districts that are outliers on several dimensions. After preliminary assessment, the following criteria were used to list outlier districts:
- Based on WB's district-level estimates of upper poverty for 2005 and 2010, changes in percentage points of poverty level were calculated. Districts where (upper level) poverty declined by more than 20 percentage points (< -20%) and where it increased by more than 10 percentage points (> +10%) were short-listed.
- WB's estimates of both upper and lower level poverty for all the upazilas allowed calculation of district-level averages for each of the two poverty measures. Since these were also available for both 2005 and 2010, changes in estimated poverty levels could be calculated. Districts for which these averages exhibited (between 2005 and 2010) either declines by more than 20 percentage points or increases by more than 10 percentage points were considered outliers.
- The upazila-level estimates also allowed calculation of variability across upazilas within a district, captured by coefficient of variation (CV is standard deviation divided by mean). Districts where the upper poverty measures exhibit CV greater than 0.4 and/or lower poverty measures exhibit CV more than 0.5, are considered outliers as well.[6]
- Finally, because of the way poverty is measured under the CBN method, the ratio of upper to lower poverty levels embody relative importance of non-food consumption and the prices of goods & services that are included in such consumption. Both low (close to unity) and high ratios of upper to lower poverty are indicative of possible outliers. After consultations, a cut-off on the upper end was considered, and any district with a ratio above 3.2 was considered an outlier.

Summary information on characteristics of all districts in terms of the above-mentioned criteria are provided in Table 1, and the list of sample districts included are listed in Table 2, Since the sampling has been purposive, adequate representations from each of the seven divisions were

---

[6] Since the mean upper poverty for a district is lot higher than the mean lower poverty, a lower CV is chosen as the cut-off for the lower poverty measure. It is also acknowledged that districts with higher share of urban areas may exhibit high CVs, and may not necessarily be included.

also ensured. A second option on the choice is identified for two divisions, though the first column of districts in Table 2 includes the ones proposed.

Table 1
Criteria for selection: Summary Statistics on District-level Changes in Poverty

District	change in district-level (Upper) Poverty		change in average of UZ (Lower) Poverty		change in average of UZ (Upper) Poverty		CV, 2010		CV, 2005		Ratio of upl to lpl > 3.2	WFP proposed selection
	<-20%	>10%	<-20%	>10%	<-20%	>10%	>0.4, upl	>0.5, lpl	>0.4, upl	>0.5, lpl		
BAGERHAT									x	x		x
BANDARBAN	x		x		x							x
BARGUNA	x		x		x							x
BARISAL												
BHOLA												x
BOGRA	x		x		x							x
BRAHMANBARIA												
CHANDPUR		x		x		x						x
CHITTAGONG							x	x	x	x		
CHUADANGA									x	x		
COMILLA												
COX'S BAZAR					x							x
DHAKA							x	x	x	x	x	
DINAJPUR												
FARIDPUR												
FENI		x		x		x						
GAIBANDHA												
GAZIPUR				x	x			x				x
GOPALGANJ												
HABIGANJ	x				x							x
JOYPURHAT												x
JAMALPUR												
JESSORE			x									
JHALOKATI												
JHENAIDAH												
KHAGRACHHARI												
KHULNA												x
KISHORGONJ												
KURIGRAM												
KUSHTIA	x				x						x	x
LAKSHMIPUR							x	x	x	x		
LALMONIRHAT												x

Note: upl = upper poverty level; lpl = lower poverty level; CV = coefficient of variation.
Crosses (x) stand for fulfilling of criterion mentioned in the top row in respective column.

Table 1 (continued)
Criteria for selection: Summary Statistics on District-level Changes in Poverty

District	change in district-level (Upper) Poverty		change in average of UZ (Lower) Poverty		change in average of UZ (Upper) Poverty		CV, 2010		CV, 2005		Ratio of upl to lpl > 3.2	WFP selection
	<-20%	>10%	<-20%	>10%	<-20%	>10%	>0.4, upl	>0.5, lpl	>0.4, upl	>0.5, lpl		
MADARIPUR												
MAGURA		x				x			x	x		
MANIKGANJ												x
MEHERPUR												
MAULVIBAZAR												
MUNSHIGANJ												
MYMENSINGH												
NAOGAON	x		x		x							x
NARAIL	x		x		x							
NARAYANGANJ								x				
NARSINGDI												
NATORE												
NAWABGANJ												x
NETRAKONA												
NILPHAMARI	x		x		x							x
NOAKHALI	x				x		x	x				
PABNA												x
PANCHAGARH	x		x		x							x
PATUAKHALI	x		x		x							x
PIROJPUR		x		x		x			x			
RAJSHAHI												
RAJBARI												
RANGAMATI												x
RANGPUR												x
SHARIATPUR		x		x		x						
SATKHIRA												
SIRAJGANJ												x
SHERPUR												
SUNAMGANJ	x				x							x
SYLHET		x		x	x		x	x				
TANGAIL												
THAKURGAON	x		x		x							x

Note: Districts in the first column, colored red, are the ones where the perception survey was administered.

Table 2
Districts sampled for the perception survey

Division	Districts
Barisal	Patuakhali
Dhaka	Gazipur, Manikganj
Chittagong	Bandarban, Rangamati, Lakshmipur, Chandpur
Khulna	Bagerhat
Rajshahi	Bogra, Naogaon, Sirajganj
Rangpur	Nilphamari, Panchagarh, Thakurgaon
Sylhet	Habiganj, Sunamganj

5. Methods

Survey method

Once the sample districts were chosen, lists of potential respondents were prepared. In many cases, this was widened to make use of information sought through personal contacts. Assistance was also sought from several NGOs in identifying potential respondents and making appointments. Three approaches were combined – (i) interview of individuals, at times, in the presence of one or two other relevant persons – predominantly in cases of government officers; (ii) consultations with groups of 5 to 10 persons – predominantly in cases of civil society representatives; and (iii) follow ups over phone to complete the sheet of information – in few cases where the personal interviews had to be shortened and the respondent needed more time to gather information. The information sheet covered only one page; and were inputted in an excel sheet to check for consistency. Of those consistent, averages from the three groups (see Section 3) were taken before arriving at the average of the three.

Quantitative representation of perceptions on relative poverty

Once the poverty measure is adequately explained to a respondent (or, a group of respondents) and all the upazilas in a district are comprehensively listed, the following steps are involved, at a general level, in order to arrive at a poverty figure for each of the upazilas:
i)   Capture the relative distances between two upazilas on a pre-defined poverty scale (generally set between 1 and 4) for all pairs of upazilas in a district. While 1 is used to represent cases of insignificant difference (perceived similarity between two alternatives/ upazilas), 2 to 4 are used in a manner such that distance between higher poverty 2 and equality (1) is considered same as the distance between lower poverty ½ and equality (1).
ii) Ensure consistency across measures of all possible pairs[7].

---

[7] Consistency is ensured by imposing law of transitivity in respondents' choice of relative rankings. That is, if stated poverty level in upazila 1 is greater than that stated for upazila 2, and stated poverty in upazila 2 is greater than that in upazila 3, stated poverty in upazila 1 ought to be greater than that in upazila 3. Interestingly, problem of social

iii) Apply aggregation principle, on a pre-designed Excel template, to arrive at a set of numbers, one for each of the upazilas, which adequately captures relative distances (on a numeric scale) between all upazilas in a district.

iv) Use the relative scale to obtain a measure of absolute figure, i.e., on prevalence of poverty expressed as percentage of poor in total population in an area, by following one of the two routes stated below:

- Drawing upon perceptions of respondents, fix the poverty figures for the two extreme points and find figures for others using the relative scale, or,

- Use the WB's district-level estimate on lower poverty and assume it to be an exact multiple of the weighted average of all relative measures. The weights used are relative shares of each upazila in total district population.

6. Selected Post-Survey Observations on Methods

The poverty figures from perception survey are presented in Annex 2 in tabular form and the upazila-level perceived poverty maps are included in Annex 3. While the earlier sections detailed the conceptual basis and discussed the criteria applied to draw the sample districts, rest of this report makes brief observations on methods (Section 6) and on findings (Section 7).

Selected observations made on the various aspects of the method applied in a perception survey are discussed below.

- **Increase in the number of choices tends to reduce consistency**: When a district has many upazilas (e.g. 10 as opposed to 5), the number of pairs to compare increases (e.g. 45 instead of 10). The size adversely affects the quality of responses due to limited attention span, and the probability of being inconsistent increases. Thus, the probability of error is likely to be positively associated with the number of upazilas in a district.

- **Perception involves multi-tiered differences which are difficult to be standardized**: No matter how much training is provided to the enumerators; it is ultimately the respondents' understanding of extreme poverty, percentages, and their perception on prevalence of such poverty (as percentage of population in an upazila) which are recorded. Within government agencies, perception on poverty prevalence is influenced by their understanding of the economic condition of an area, which may not always be a close correlate of poverty rates. In contrast, there is a tendency to exaggerate poverty figures among development practitioners in the NGO sector; and elected members tend to exaggerate poverty levels in their constituencies.

- **Triangulation unfortunately (or, fortunately) has no closure rule** – that is, there is no unanimous view on how perceptions of different people may be aggregated. We identified three sets, and availability dictated who within the set could be interviewed; and average of all consistent responses (showing consistency ratio of 0.10 or less) was chosen as the final finding. More importantly, even if a person in a given position was chosen in all districts, reliability of responses could vary widely.

choice, *a la* Kenneth Arrow, is avoided by simple aggregation of responses by several individuals (or, groups of individuals).

- **Perception of poverty takes time to form in new administrative zone:** In cases where an upazila got divided, people's perception (especially of those who can compare across all upazilas in a district) may take a while to differentiate the newly formed upazilas. It was the case in Patuakhali, where many administrative units (within as well as outside the government) were still functioning from the old (Galachipa) upazila headquarter.
- **External connectivity may adversely affect depth of knowledge about local issues:** The level of integration within a district has possibly declined significantly, as it happens with all other instances of increased external connectivity. The process adversely affects the continuity in knowledge base of the urban population within the district. Thus, incoherence and incompleteness may increase with increased connectivity of a district where the parts (upazilas) of a district are not connected via the district headquarter (i.e., the district headquarter does not act as the hub for all upazilas in that district).
- **There is more than one type of poverty:** It is recognized that there are areas with regular prevalence of poverty, and there are areas where extent of poverty variations seasonally. In addition, much focus has been on disaster-triggered poverty. In all those cases, the target population has generally been those owning no or little asset. Extensive consultations revealed that poverty of the asset-holders, particularly the smallholders, arising out of production and/or market failures, needs greater focus. Thus, respondents in some areas found a single measure to capture all dimensions to be inadequate.

7. Summary Observations on Findings

The findings on perception-based poverty measures are given in details in Annex 2. Thus, observations on the findings, in the absence of comparable data, will be limited. These are,

- The SAE based district-level estimates of lower poverty (2010), appear to be significantly higher than those perceived by key informants in Chandpur and Bagerhat districts (see Annex 2). Such differences may arise due to three reasons: (i) the SAE based exercise over-estimated, because of inadequate data or/and improper specification; (ii) situation has improved significantly in the two districts since 2010; and (iii) indicators perceived important by respondents do not match with those captured by income-based poverty calculations. Field level consultations suggest that fast-changing soil fertility and drastic declines in productivity of shrimp/fish cultivation in some parts of Bagerhat district may explain some of the differences.
- The SAE based district-level estimates of lower poverty (2010) are markedly lower than the SAE based estimates for Bogra, Rangamati and Naogaon. Perceived poverty levels are reportedly higher than the SAE based estimates in several other districts as well, notably in Manikganj, Gazipur and Panchagarh.
- Inequality in perceived poverty prevalence across upazilas is found to be the least in Gazipur; and it is reasonably low (below 0.22) in Patuakhali, Thakurgaon, Nilphamari, Naogaon and Bogra. At the other extreme, variations in poverty prevalence across upazilas are very high in Bagerhat, Bandarban, Chandpur, Habiganj and Lakshmipur. SAE-based upazila-level poverty estimates, reportedly prepared by the WB, were not made available to the ERG research team; and therefore, no comparison could be made on relative ranking of upazilas (in terms of poverty) within each of the sample districts.

REFERENCES

Bangladesh Bureau of Statistics, *Report of the Household Income & Expenditure Survey 2010*, Ministry of Planning.

Bozóki, S. and Rapcsák, T. On Saaty's and Koczkodaj 's inconsistencies of pairwise comparison matrices, Journal of Global Optimization, 42(2), pp.157-175.

Cohen, Alasdair. The Multidimensional Poverty Assessment Tool, 2009, IFAD.

Hassan Md. Zahidul & Md. Imrul Hassan; Data Analysis and Technical Assistance (DATA), limited; Field Validation of Poverty Estimates, 2008; *Pair wise comparison: A Perception Survey on Relative Prevalence of Poverty*

Nadja Kasperczyk, Karlheinz Knickel;   *Analytic Hierarchy Process (AHP)*

Pelaez, J.I. and M.T. Lamata ; *A New Measure of Consistency for Positive Reciprocal Matrices;* *Volume 46, Issue 12, December 2003, Pages 1839–1845*; Computers and Mathematics with Applications

Saaty Thomas L. *Decision –making with the AHP: Why is the principal eigenvector necessary;* European Journal of Operational Research 145 (2003), 85-91

Annexure 1

Pair-wise Comparison and a Guide to the Exercise

The analytic hierarchy process is followed for recording responses. This is a multi-criteria decision making method, which allows derivation of ratio scales from paired comparisons. Ratio scales that determine relative rankings of the alternatives can be derived from actual measurements (in this case actual poverty estimates), as well as subjective opinions in terms of 'preferences'.[8] Respondents are asked to sequentially compare and rank a upazila relative to all other upazils in terms of poverty prevalence, based on their perceived knowledge of poverty in various areas within a district. The comparison allows for the following subjective judgment:

Much Higher = 4, Higher = 3, Slightly Higher = 2, Same/Similar = 1,
Slightly Lower = 1/2, Lower = 1/3, and Much Lower = 1/4.

It is evident from the preset scales that a value of 4 for assessing A (say, a upazila) over B (another upazila) is consistent with having a value of ¼ when B is assessed over A. Thus, in a case with n number of upazilas in a district, a (n x n) matrix can capture all pair-wise preferences; yet, we need to fill in only $n(n/2 - 1)$ cells. An illustration with 4 upazilas is provided in Table A.1. The literature terms it as a judgment matrix.

Table 1.1: Matrix for recording Key Informants' Response by upazilas in a district

	Upazila 1	Upazila 2	Upazila 3	Upazila 4
Upazila 1	1	2	3	4
Upazila 2	½	1	2	3
Upazila 3	1/3	½	1	2
Upazila 4	1/4	1/3	1/2	1

The responses on rankings for every upazila are normalized (across columns) and averaged (across rows) to arrive at the 'Priority vector'.[9] The latter, if rankings are consistent, provide information on two items: (i) relative measures of upazila-level poverty which add up to unity; and (ii) the upazila with maximum poverty and that with minimum poverty. It will however be necessary to obtain/derive poverty measures in the two extreme upazilas in order to derive percent of poor population in all the upazilas.

Consistency should be maintained in respondents' rankings, which can be done by checking manually or writing a simple algorithm that verifies fulfillment of the law of transitivity. An alternative is to calculate Consistency Index and Consistency Ratio by using the eigen vector, as outlined below:

---

[8] Kasperczyk and Knickel suggest that this method aims to capture both objective and subjective measures, and assumes complete aggregation among its response criteria. Economists would disagree coining of the term.
[9] The normalized vector of weighted scores for every upazila is known as the Eigen or priority vector, whose elements, the weighted scores, determine relative status of poverty in each area. This is a numerical ranking of the weighted scores indicating the order of preference among them (Saaty, 2001)

- The Eigen vector of weighted scores is multiplied by original comparison matrix to obtain a new product vector, whose maximum eigenvalue is calculated by averaging the ratios of each element of product vector to elements in the weighted vector. The eigenvalue is a set of scalars that can be said to be a characteristic root of the priority vector or, how 'skewed' the priority vector gets due to inconsistency in responses. Therefore the magnitude of the 'change' or variation among responses, if any, is indicated by the maximum eigenvalue of the weighted priority vector.

- The maximum eigenvalue is a numerical measure of the degree of inconsistency of the pair wise comparison matrix. Its significance is that it should be approximately equal to the size of the comparison matrix, in order to have consistency (Saaty). That is, the eigenvalue of a consistent comparison matrix should be equal to the number of comparisons in a matrix. Greater the difference between the maximum eigenvalue and matrix size, the more inconsistent the comparison matrix will be. Such inconsistency suggests of judgment responses that might have been too random, and not based on perceptions regarding common attributes.

- Maximum eigenvalue required for calculation of Consistency Index, whose value if closer to 0 would indicate greater consistency, or less difference between the eigenvalue and matrix size. Lastly, a Consistency ratio is derived, which is the ratio of the C.I to a corresponding Random Index value. The latter is the outcome of Monte Carlo experiments showing figures on index of consistency for random judgment values corresponding to a particular matrix size (developed by Saaty). This ratio, if less than or equal to 0.1 would mean higher consistency in responses, and therefore, an acceptance of matrix for further calculation of mean percentages of poor population in remaining areas. Values closer to 0.9 would mean the judgment matrix is almost completely random and inconsistent, therefore should be rejected. This value however, could be an arbitrary measure of consistency (Lamata, 2002). Also, a much larger Random Index table would be required for areas that will require a considerable number of upazila level comparisons in order to generate the Consistency ratio.

- Finally, the mean value of percentage of poor population in all the best and worst off areas of every district and upazila is calculated, only using the accepted matrices, while the percentage of poor population in remaining areas are to be calculated by interpolating existing average weighted scores and percentage of poor population.

The existing methodology however, does not clearly mention how we are to generate percentage figures of poor population in the best and worst off upazilas. Two possible ways of arriving at percentage estimates are (see Annex 2 where results from both are presented):

(i)   Obtain percentage figures on the two extreme upazilas from an independent source or from the respondents.
(ii)   Use district level estimates from SAE based Poverty Mapping exercise and use population shares as weights to derive upazila-level figures that are consistent with the district-level figure.

ANNEX 2: Statistical Tables on Findings from ERG Perception Survey

Table 2.1

DISTRICT	Percep	SAEadj		DISTRICT	Percep	SAEadj
Bagerhat	*17.58*	*24.02*		**Bandarban**	*32.17*	*21.61*
Bagerhat sadar	16.40	22.41		Alikadam	25.85	19.86
Chitalmari	12.78	17.47		Bandarban Sadar	24.43	18.78
Fakirhat	8.30	11.35		Lama	23.07	17.73
Kachua	12.59	17.20		Naikhongchhari	27.87	21.42
Mollarhat	12.28	16.78		Rowangchhari	38.56	29.63
Mongla	21.23	29.00		Ruma	30.87	23.72
Morelganj	23.64	32.29		Thanchi	55.33	42.52
Rampal	31.39	42.89				
Sarankhola	28.89	39.48				

Notes valid for all Tables: Figures under column "Percep" are from the Perception Survey, where the district-level poverty is arrived at by using population shares as weights. Figures under column "SAEadj" take the SAE based district level poverty estimate for 2010, and use the ratio of the two district-level estimates to derive the adjusted upazila-level figures (consistent with the SAE based estimate for respective district).

Table 2.2

DISTRICT	Percep	SAEadj		DISTRICT	Percep	SAEadj
Bogra	*29.79*	*6.72*		**Chandpur**	*23.79*	*30.31*
Adamdighi	23.52	5.31		Chandpur sadar	18.00	22.94
Bogra Sadar	22.66	5.11		Faridganj	17.44	22.23
Dhubchancia	24.56	5.54		Haimchar	46.67	59.46
Dhunat	37.55	8.47		Haziganj	15.53	19.78
Gabtali	33.58	7.58		Kachua	25.94	33.05
Kahaloo	26.31	5.94		Matlab Dakshin	26.50	33.77
Nandigram	23.93	5.40		Matlab Uttar	32.31	41.16
Sariakandi	42.33	9.55		Shahrasti	30.64	39.04
Shajahanpur	32.18	7.26				
Sherpur	30.19	6.81				
Shibganj	29.63	6.68				
Sonatola	31.46	7.10				

Table 2.3

DISTRICT	Percep	SAEadj		DISTRICT	Percep	SAEadj
Gazipur	*16.94*	*8.19*		**Habiganj**	*17.61*	*20.14*
Gazipur Sadar	15.21	7.35		Ajmiriganj	34.58	39.56
Kaliakair	17.11	8.27		Bahubal	23.08	26.39
Kaliganj	19.15	9.26		Baniachong	25.95	29.68
Kapasia	22.13	10.70		Chunarughat	16.92	19.35
Sreepur	18.41	8.90		Habiganj Sadar	9.02	10.32
(Tongi Munic)	(15.45)	(7.47)		Lakhai	27.87	31.88
Note: Figures for Gazipur Sadar, excl Tongi municipality: 15.10% & 7.30%				Madhabpur	13.90	15.90
				Nabiganj	08.64	09.88

Table 2.4

DISTRICT	Percep	SAEadj		DISTRICT	Percep	SAEadj
Lakshmipur	*35.14*	*18.13*		**Manikganj**	*24.96*	*18.84*
Kamalnagar	56.67	29.23		Daulatpur	29.98	11.74
Lakshmipur sadar	27.74	14.31		Ghior	20.56	8.05
Raipura	26.35	13.60		Harirampur	32.23	12.63
Ramganj	25.51	13.16		Manikganj sadar	14.51	5.68
Ramgati	53.90	27.80		Saturia	19.04	7.46
				Shibalaya	22.01	8.62
				Singair	15.71	6.15

Table 2.5

DISTRICT	Percep	SAEadj		DISTRICT	Percep	SAEadj
Naogaon	*24.09*	*7.00*		**Nilphamari**	*24.96*	*18.84*
Atrai	30.06	8.73		Dimla	26.70	20.15
Badalgachhi	30.18	8.77		Domar	25.39	19.17
Dhamoirhat	26.81	7.79		Jaldhaka	31.63	23.87
Mahadebpur	21.55	6.26		Kishoreganj	29.08	21.95
Manda	23.98	6.97		Nilphamari sadar	19.62	14.81
Naogaon sadar	17.41	5.06		Saidpur	18.85	14.22
Niamatpur	23.67	6.88				
Patnitala	22.60	6.57				
Porsha	18.74	5.44				
Raninagar	36.40	10.58				
Sapahar	21.00	6.10				

Table 2.6

DISTRICT	Percep	SAEadj		DISTRICT	Percep	SAEadj
Panchagarh	*24.58*	*12.32*		**Patuakhali**	*15.11*	*14.70*
Atwari	40.33	20.22		Bauphal	20.43	19.87
Boda	27.60	13.84		Dashmina	26.51	25.78
Debiganj	37.78	18.94		Dumki	16.71	16.26
Panchagarh sadar	25.00	12.53		Galachipa	24.18	23.52
Tentulia	31.87	15.98		Kalapara	18.15	17.66
				Mirzaganj	25.81	25.10
				Patuakhali sadar	15.80	15.37
				(Rangabali)	(27.50)	(26.75)

Note: Figures for Galachipa, excluding Rangabali, from the perception survey and the adjusted figures are respectively, 22.55% and 22.13%.

Table 2.7

DISTRICT	Percep	SAEadj		DISTRICT	Percep	SAEadj
Rangamati	*28.17*	*6.75*		**Sirajganj**	*25.55*	*22.73*
Baghaichhari	34.85	8.35		Belkuchi	24.41	21.71
Barkal	35.03	8.39		Chauhali	36.13	32.14
Belaichhari	49.95	11.97		Kamarkhanda	29.24	26.02
Juraichhari	38.51	9.23		Kazipur	33.30	29.63
Kaptai	19.05	4.57		Royganj	23.79	21.16
Kawkhali	22.67	5.43		Shahjadpur	23.23	20.67
Langadu	29.58	7.09		Sirajganj sadar	22.33	19.87
Naniarchar	29.25	7.01		Tarash	29.35	26.11
Rajasthali	30.34	7.27		Ullahpara	23.66	21.04
Rangamati Sadar	18.41	4.41				

Table 2.8

DISTRICT	Percep	SAEadj		DISTRICT	Percep	SAEadj
Sunamganj	*23.47*	*20.55*		**Thakurgaon**	*23.13*	*13.80*
Bishwambapur	33.92	29.71		Baliadangi	30.87	18.42
Chhatak	17.30	15.15		Haripur	35.00	20.88
Dakshin Sunamganj	22.72	19.70		Pirganj	27.97	16.69
Derai	25.68	22.49		Ranisankail	25.65	15.30
Dharmapasha	36.75	32.18		Thakurgaon sadar	24.33	14.52
Dowarabazar	29.28	25.64				
Jagannathpur	18.42	16.13				
Jamalganj	28.06	24.57				
Sulla	43.05	37.70				
Sunamganj Sadar	17.03	14.91				
Tahirpur	25.43	22.26				

ANNEX 3

Perception-based Upazila Poverty Maps in Selected Districts in Bangladesh, 2014