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Spatial Divergence of Primary Education Development in Bangladesh through the Lens of Education Development Index (EDI)

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Abstract

This paper addresses the issue of spatial divergence in educational performances in primary education sector through the construction of education development index (EDI). The paper uses principal component analysis to generate weights for indicators used in the construction of multidimensional general EDI. The paper finds that upazilas are, in general, performing poorly in terms of school access, school infrastructure, and school outcome. While upazilas from metropolitan areas perform very well and remain at the high range of each EDIs; upazilas from the 'haor' region, the Chittagong Hill Tracts (CHT), the coastal region and the regions along the Jamuna River perform poorly and remain at the very bottom range of each EDIs.

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I. Introduction

When policy-makers are to allocate limited resources for educational development, well informed decision-making is very crucial for efficient use of resources. Having sound knowledge about the educational performances of different regions across the country can be helpful in the decision making process for resource allocation and policy formulations. A composite measure of educational performances by spatial entities helps not only in monitoring progress in the outcomes, but also in targeting planning and funding to reduce spatial disparities. Better targeting and channeling resources to lagging regions can not only improve the goal of overall educational development, but also promote equity and bridge gaps in educational attainment between the lagging and the leading regions. Thus, a multidiemnsional composite indicator of educational development derived from related indicators from a reliable database can play vital role in identification of lagging regions in terms of educational performances and in policy formulation for resource mobilisation. This paper attempts to develop a multidimensional composite indicator for the primary education development across the upazilas in Bangladesh and to identify the lagging regions for potential policy intervention. Particularly, the paper constructs the Education Development Index (EDI) for the primary education sector of Bangladesh[3]. The instrument facilitates cross-sectional analysis of the levels of attainment in education among different regions of Bangladesh and draws policy attention to crucial parameters which need to be dealt with effectively for achieving equity in access and attainment in educational development.

The choice of primary education sector for this paper is mainly driven by two reasons-the data availability and the sector's single-handed management by the government. Bangladesh has one of the largest primary education systems in the world with an estimated 16.4 million primary school aged children (6 to10 years). There are 365,925 primary school teachers, working in more than 82,218 schools. Education Management of Information System (EMIS) division of Directorate of Primary Education (DPE) under Ministry of Primary and Mass Education (MoPME) undertakes a census of all the primary schools of the country every year. The latest one was carried out in 2011 and this census covers all 11 types of primary schools including Madrashas (Ebtedayee) and Kindergarten. To our knowledge, we are not aware of existence of any such database for the secondary and the tertiary level of education system in Bangladesh. Moreover, secondary and tertiary education systems are not completely managed

[3] The EDI is considered as an analytical tool for measuring the educational development at different administrative levels, such as, upazillas, districts and divisions, of the country.

by the public sector. Private sector plays important role in these level of education. In addition, returns from investmnets made for the development of elementary and primary education are quite high (see Papageorgiou, 2001, Dreze, 2005; and Psacharopoulos and Layard, 2012).

Education and Development

Schooling enables students to learn the skills that propel individual labor productivity which is critical for economic growth and poverty reduction. The wide-ranging contributions of education to economic development through the development of human capital is unanoymaysly accepted among the economists, the social scientists and the policy makers. Besides the accumulation of physical capital, the human capital (skills and education embodied in human beings) helps explaining the faster economic development in many countries (dreze, 2005). Economic development will not sustain in absence of improvements in human development (Ranis et. al., 2000). Education helps to sustain and accelerate overall economic developmentt through providing essential skilled manpower for both the advanced sector and the informal sector of an economy, and acting as a catalyst in encouraging modern attitude and aspirations (Psacharopoulos and Woodhall, 1985). For instance, the high rates of economic growth of East Asian economies in the 1980s and 1990s had something to do with their high levels of investment in human capital, particularly the early expansion of elementary education (Dreze, 2005).

Many studies have examined the role of investments in education on the national income following the pioneering work done by Jacob Mincer in 1976 on the role of schooling in earnings. These studies showed that the economic returns to education were typically much higher than the returns to physical investment. Colclough (1982) reviewed evidences on the role of primary schooling on economic development and concluded that primary schooling increases productivity in all sectors of the economy, and that the economic returns to investment in primary education are in many countries considerably greater than those arising from other levels of schooling. Psacharopoulos and Layard (2012) also have shown that returns to schooling are the highest at the primary level and the returns to schooling is even higher in low or middle income countries compared to high income countries. The returns from primary education is higher because the primary education contributes directly to production of final output, while the post-primary education contributes mainly to adoption and innovation of technology (Papageorgiou, 2001).

Education not only works through improving the skill of workers, but also play important role in favorable 'demographic transitions'-one major driver of economic development in many countries. It is widely acknowledged that spread of education is one of the powerful factors behind the 'demographic transition'-the transition from high to low level of fertility. Especially female education played even more role behind this transition. An important link has been found between parental education, particularly the level of a mother's education, and a child's health. The overwhelming influence of female education on demographic and health outcomes, even after controlling for other relevant variables, routinely emerges in multivariate statistical analysis (Dreze, 2005).

A positive relationships between education and agricultural productivity have also been emerged in many studies. Appleton and Balihuta (1996) examined the external benefits of education in agriculture using the education of neighboring farmers in Uganda. They have shown that a 1-year rise in the average primary schooling of neighboring farmers is associated with a 4.3% rise in output compared with a 2.8% effect of own farmer primary education. Education raises the productivity of farmers through adoption of modern technology and better knowledge about input mixes (Psacharopoulos and Woodhall, 1985).

Other than direct income enhancing effects of primary schooling, it has other indirect socio-economic effects that are important to the process of economic development. A host of social and non-market benefits are also produced by schooling, including but not limited to efficiency of consumer choices, and social capital. Moreover, appropriate investment in primary education is also conducive for achieving pro-poor economic growth. The wide-ranging roles of education in development, therefore, are going well beyond the initial focus on economic returns.

Improvment of educational performances at the primary level is, therefore, a pre-condition for long-term sustainable economic development for an aspiring economy. To improve overall educational perfomances, five dimensions of primary educational development-access to school, better school infrastructure, school quality, gender parity and learning outcomes need to be - need to get due attention. The availability of schools only cannot ensure quality educational development; quality educational attainment depends on easy school access, better school facilities, and gender-friendly educational environment. If parents perceive the quality of their children's schooling to be poor, or the school is far from their house, or their doughter wouldn't be treated properly at school; then they may be reluctant to send their children to school (White 2004). Thus, besides educational outcomes, other indicators related to access,

equity, infrastructure, and schooling quality are also very important for overall educational development of a country. A favorable composite measure of educational development that captures many dimensions such as access, inputs, quality, gender-parity, and outcome would enable policy makers in developing countries to target and to channel scarce resources in lagging regions more efficiently.

Use of Composite Index in Other Areas of Empirical Research Using PCA

The construction and use of multidimensional composite index is not eniterly new in economic literature. In fact, construction of composite indices has become a popular practice in empirical research in assessing the progress in overall well-being of societies. The 'Human Development Index' (HDI) of the United Nations Development Programme (UNDP), the 'Lisbon Strategy Indices' (LSI) of the European Union (EU) and the 'Trade and Development Index' (TDI) of the United Nations Conference on Trade and Development (UNCTAD) are examples of such practice. A crucial step in the construction of a composite index is the selection of the relative weights for the different dimensions. Both parametric and non-parametric methods are used in the construction of composite index. In non-parametric method, the weights used among indicators are determined subjectively by experts based on their knowledge about the indicators. For example, HDI and LSI use non-parametric methods and assign equal weights to all dimensions. HDI assigns equal weights to income, health and education based on the normative assumption that all human beings value three dimensions equally (Decancq and Lugo, 2010). In parametric methods, however, the weights among indicators or sub-indices are determined by the relative variation among those indicators. UCTAD follows parametric approach assigning weights to the related indicators in construction of the TDI. Parametric methods assume there is some structure behind the variation of the indicators used for multidimensional index and hence the weights for these indicators are determined by the covariation between them on each dimension of the structure. Parametric methods are statistically sound since the weights are determined by the sample indicators themselves.

The commonly applied parametric methods are the Common Factor Analysis (CFA) and the Principal Components Analysis (PCA). PCA is, however, preferred over CFA for two reasons: it's simple to apply mathematically since no assumptions are attached to the original data (Stevens, 1992); and PCA does not have to account for factor indeterminacy, a troublesome feature of CFA (Steiger, 1979). In the current literature, principal components analysis (PCA) are most widely used method for generating multidimensional composite indices. PCA is, however, essentially designed for normal continuous variables (Booysen et.al., 2008;

Kolenikov and Angeles, 2009). Vyas and Kumaranayake (2006) also warns that issues related to the underlying data will affect PCA and this should be considered when creating and interpreting results. Given the continuous nature of our data[4], we have chosen PCA method for the construction of a composite index of primary education development across upazilas in Bangladesh.

Principal component analysis (PCA)-a standard multivariate technique for aggregating information scattered in many measures-has been used in Filmer and Pritchett (1998, 2001) to construct socioeconomic indices using household assets, access to hygienic facilities, and dwelling characteristics. The methodology quickly became popular among the empirical economists for construction of composite indicator from a range of diverge indicators that are correlated (Gwatkin et.al., 2003a, 2003b, 2007). The use of PCA has become routine application for generating a unidimensional measure of socio-economic status (SES) from different types of asset data (see Gwatkin et al. 2000; Filmer and Pritchett 2001; McKenzie 2003). The World Bank, in its series of 'Socio-economic differences in health, nutrition, and population', has also constructed PCA-based asset indices using DHS data (e.g. Gwatkin et al. Dreher (2006) and Heshmati (2003, 2006) constructed multidimensional composite globalization indices to monitor the progress and the level of globalization across the world. Bo and Yuen Pau (2008) uses two-stage principal component analysis (PCA) to generate a composite index of economic integration among countries in the Asia-Pacific (AP) region.

EDI related literature

The use of multidimensional index for monitoring the progress in educational performances is, however, not longstanding in the relevant literature. UNESCO is pioneer in using multidimensional index as it periodically publishes and monitors progress in educational performances across the world with a composite index the "Education for all Development Index (EDI)" since 2006. UNESCO uses four outcome indicators to develop the composite indicators and they are: primary adjusted net enrollment ratio, adult literacy rate for those aged 15 and above, the survival rate to grade 5, and three gender parity indices for primary education, secondary education, and adult literacy. Instead of using data-driven weights, UNESCO, however, assign equal weight to each component in the overall composite index.

UNESCO's EDI ranks countries' educational performances and monitors the progress over time and across countries. In 2006 EDI, Bangladesh ranked 109 among 129 countries with EDI

[4] Distribution of each indicators are discussed in the following section.

score of 0.753: 0.92 for primary adjusted enrollment rate, 0.525 for adult literacy rate, 0.914 for gender parity, and 0.651 for the survival rate .Bangladesh was lagging behind much in terms of adult literacy rate and survival rate (UNESCO, 2006). Among south Asian countries, while Bangladesh was performing better than Nepal and Pakistan, she was lagging behind India and Bhutan. All the south Asian countries included the EDI was, however, in the low EDI range[5]. In 2012, Bangladesh moved a couple of places up to be ranked 97th with EDI score of 0.778[6] (UNESCO, 2015). Score of adult literacy component has been improved from 0.525 to 0.588, while scores of other components remain stagnant. Bangladesh was performing well in terms of UNESCO's EDI compared to Nepal and Pakistan, but lagging behind Sri Lanka and Bhutan. While Bangladesh is still in the range of low EDI score, Sri Lanka and Bhutan are in the range of medium EDI score. AS UNESCO's EDI was developed based on indicators reflecting four out of the six Dakar goals, EDI of UNESCO is more or less outcome oriented (Jhingran and Shankar, 2009).

Earlier notable efforts to construct EDI using the principal component analysis include Yadav and Srivastava (2005), Jhingran and Shankar (2009), and World Bank (2009). Both Yadav and Srivastava (2005) and Jhingran and Shankar (2009) constructed education development index for India at state level and district level respectively. Yadav and Srivastava (2005) leaves out the process and inputs and uses different educational outcomes to generate the EDI. Jhingran and Shankar (2009) addresses education disparities in India in a World Bank study through the construction of district level education development index. For identifying the deprived districts in terms inputs, outputs and overall educational development of elementary education; they have constructed district level EDI for 2003-04. They have constructed separate indices for the status of various dimensions of education development-input, equity and outcome-along with the multidimensional composite "Education Development Index" (EDI) to monitor the overall progress. Finally, they have examined whether the Per Child Allocation (PCA) for universal primary schooling was distributed across the country in an equity oriented manner, i.e. whether the more deprived regions in terms of EDIs were allocated relatively higher funds. Comparing the ratios to expenditures with ratio of district level EDIs, they have shown that there is real disconnect between the real investment needs of the districts reflected through the EDIs and the actual allocation made on annual basis.

[5] Sri Lanka and Maldives were not included in the 2006 EDI of UNESCO.
[6] Rankings of 2007 and 2012 are not directly comparable as the number of countries included in the construction of EDI was different. While 129 countries were included in 2006 EDI, 113 countries were included in 2012 EDI.

World Bank (2009) has made first attempt to measure the overall educational performances at the primary level in Bangladesh by developing a composite education development index (EDI) using the PCA based weights for each dimensions, despite serious constraint in terms of sound data availability. The index has been measured at the upazila, district and the division level. The study has identified some regions-for example, the Sylhet region, Chittagong hill tracts- those are severely lagging behind other regions. While the Sylhet region has a history of struggling in terms of educational attainment, Chittagong hill tracts also have their own reality. Most of the areas with highest incidence of poverty are identified as poorly performing areas according to EDI. With some exceptions, economically disadvantaged regions are suffering in terms of overall EDI ranking.

Despite many achievements during the past decade, major improvements are still needed in order for all children to receive the benefit of quality education. The major challenges include: poor quality of education; high dropout rates; promotion of equity and accessing education; decentralization of education administration; and special needs education. The Third Primary Education Development Programme [7](PEDP 3) has set the ambitious target of providing quality education for all children through the development of 'an efficient, effective and equitable primary education system delivering effective and relevant child-friendly learning'. PEDP 3 focuses on four pillars to improve the whole primary education system. First, better quality of learning – through having more teachers, who are better trained, students having access to textbooks, and students getting more overall learning time in school. Second, greater participation - greater community oversight, combined with targeted needs based stipends to the poorest, will result in improved enrolment, attendance and ultimately more students graduating from primary education. Third, better sector management - school planning and management will be decentralised, with greater input from local communities and parents. There will also be greater accountability over the public education budget. Fourth, better infrastructure - the programme will construct classrooms, and ensure that safe drinking water and clean toilets are available in all schools.

Achieving the objectives set out in PEDP 3 will not be easy. Opportunities for good quality education in Bangladesh are limited by inequalities associated with wealth, location, ethnicity, gender, and other factors. Moreover, the education system is characterised by low levels of

[7] A coalition of ten development agencies have partnered with the Ministry of Primary and Mass Education (MoPME) is implementing PEDP 3. The programme builds on the commitments made under the National Education Policy (2010), and has the support of the non-state sector, which is a key implementing partner in education.

average learning achievement and marked social disparities in reported competencies as the Bangladesh government recognises, enhanced equity in access and learning is a pre-condition for successful implementation of PEDP 3. Against this backdrop the key objective of this study is to recommend how primary education budget should be channelled to areas and to population groups deprived of primary education in Bangladesh. In order to do so, the study will map out the geographical areas and identify the population groups that are not benefitting from government provision of primary education in Bangladesh by developing Upazilla-wise Education Development Index (EDI). EDI could be an instrument determining the deprived areas/administrative units that need special attention to the policy makers.

The overall objective of this paper is to construct a multidimensional index to monitor and to compare the performances of primary educational development at the upazila level in Bangladesh using most recent census data. The specific objectives are: i) to identify the lagging regions in terms different dimensions of educational performances at the primary level; ii) to compare the progress over time across upazilas using the new EDIs and the EDIs presented in World Bank (2009); and iii) to recommend appropriate policy measures to improve spatial equity across the country along with the overall educational development.

Rest of the paper is organized as follows: following the introductory discussions in Section I, a methodological framework for the construction of multidimenstion education development index has been provided in section II. Section II discusses the main bulding blocks of EDI and the method of principal component analysis (PCA) which is used for generating weights for the indicators used in the EDI. Data, descriptive statistics of indicators related to primary education, and the kernel densities of normalised indicators are discussed in section III. Section IV presents the weights in the construction of EDI and its sub-components. Distribution, depth, and severity of EDIs and related indicators are also discussed in this section. Spatial distribution of EDIs and the performances of upazilas in terms of EDIs are analysed in section V. The paper ends with concluding remarks in Section VI.

II. Methodological Framework

Major Building blocks in the EDI Construction

This paper follows the similar methodology developed in World Bank (2009). This exercise has twin goals. First, the constructed EDIs will directly add value to the thinking on resource allocation system of the existing primary education programmes. It will also allow policy

makers to look at the needs of the upazillas in terms of educational parameters. Second, newly constructed EDIs would capacitate policy makers to understand the trends and dynamics of development of primary education over the period of 2007 and 2011. This understanding would help informed policy formulation targeting the areas with very low EDI.

The EDI for the primary education sector of Bangladesh has been constructed at the upazilla level. Five broad parameters and 19 sub-parameters (individual indicators) have been selected. The broad parameters are (i) Access, (ii) Infrastructure, (iii) Quality, (iv) Gender Equity, and (v) Outcome. The first three broad parameters can be considered as input parameters. While an ideal EDI should only include outcome parameters as is done by UNESCO (2005), the current study, as in World Bank (2009), include both input and output parameters. There are several reasons for including both kinds of parameters: first, there is time-lag in translating inputs and process into outcomes and hence, it is important to assess the status of the inputs independent of outcomes; second, past experience show that having adequate quantity of resources in place does not necessarily ensure educational development unless the quality of those resources and efficient utilization are ensured.

The biggest challenge in developing an EDI is selecting the indicators. After the parameters are selected associated weights have to be calculated. World Bank (2009) reviewed available literatures on EDI around the world and listed all the indicators that could be used in constructing EDIs in Bangladesh. All of these identified variables were not necessarily available in the same format in Bangladesh. Therefore, a list of available variables was also developed. Our current study also considers the almost same set of indicators, as was used in World Bank (2009), with some adjustments. Box 1 presents the list of indicators used in the present study.

Box 1: Indicators used to construct EDI in the Present Study[8]

Access EDI Indicators related to schools coverage.	1. Schools per thousand populations 2. Accessibility of schools
Infrastructure EDI Indicators related to physical infrastructural environment of the schools.	1. School with safe water 2. School with electricity 3. School with toilet per 100 students 4. Average room condition of the school 5. Distance from optimal student-room ratio
Quality EDI Indicators related to quality teaching facilities.	1. Distance from optimal students-teacher ratio 2. Qualification of teachers 3. Availability of teaching-learning materials
Gender Equity EDI Indicators related to gender equity.	1. Distance from optimal ratio of girls among total students 2. Distance from optimal ratio of female among teachers 3. Schools having separate toilet for girls 4. Gender equity in dropout rate
Outcome EDI Indicators related to outcome.	1. Gross enrolment ratio 2. Pass rate at grade five 3. Attendance rate 4. Dropout rate 5. Repetition rate
Overall EDI	1. Access EDI 2. Infrastructure EDI 3. Quality EDI 4. Gender Equity EDI 5. Outcome EDI

Estimation of weights for each indicator in the index

This study has applied the Principal Component Analysis (PCA) method for each pre-defined *dimension* and calculated weights for each of the indicators within the dimension. The objective of PCA is to reduce the dimensionality (number of indicators) of the data set but retain most of the original variability in the data. This involves a mathematical procedure that transforms a number of possibly correlated variables into a smaller number of uncorrelated variables called principal components. The first principal component accounts for as much of the variability in the data as possible, and each succeeding component accounts for as much of the remaining variability as possible. Thus using PCA one can reduce the whole set of indicators into few *factors* (underlying dimensions) and also can construct *dimension* index using factor-loading values as the weight of the particular variable.

Thus, the overall EDI constructed for this analysis will be a summation of five major indices. These are: (i) access index, (ii) infrastructure index, (iii) quality index, (iv) gender equity index

[8] Description of each indicator is provided in Annex A.

and (v) outcome index. Each of these sub-indices is generated following the similar approach using relevant indicators.

The original indicators that measure thee ducational performances are measured in usually measured in different scales. The following procedure, equation (1), is adopted to convert indicators into their normalized form. First the Best and Worst values in an indicator are identified. The BEST and the WORST values will depend upon the nature of a particular indicator. In case of a positive indicator, the HIGHEST value will be treated as the BEST value and the LOWEST, will be considered as the WORST value. Similarly, if the indicator is NEGATIVE in nature, then the LOWEST value will be considered as the BEST value and the HIGHEST, the WORST value. Once the Best and Worst values are identified, the following formula is used to obtain normalize values:

$$\boldsymbol{NV_{ij} = 1 - \left[\frac{(Best_i - Observed_{ij})}{(Best_i - Worst_i)}\right]} \qquad (1)$$

Where, NV_{ij} is the normalised value for the ith indicator of the jth upazilla. $Best_i$ is the best value of the ith indicator, $Worst_i$ is the worst value of the ith indicator and $Observed_{ij}$ is the observed value of the jth upazilla for the ith indicator. NV_{ij} always lies between 0 and 1.

The first task under PCA is to extract the Principal Components (factors). This depends upon the Eigen value of the factors. The Eigen value of a Principal Component explains the amount of variation extracted by the Principal Component and hence gives an indication of the importance or significance of the Principal Component. According to Kaiser's Criterion only Principal Components having Eigen values greater than one should be considered as essential and should be retained in the analysis. Weight for each variable is calculated from the product of factor loadings of the principal components with their corresponding Eigen values. In the first step, all factor loadings are considered in absolute term. Then the principal components, which are higher than one, are considered and their factor loadings are multiplied with the corresponding Eigen values for each variable. In the next step, the weight for each variable is calculated as the share of the aforementioned product for each variable in the sum of such product. The index is then calculated using the following formula

$$EDI = \frac{\sum_{i=1}^{n} X_i\left(\sum_{k=1}^{m} L_{ik}E_k\right)}{\sum_{i=1}^{n}\left(\sum_{k=1}^{m} L_{ik}E_k\right)} \qquad (2)$$

Where EDI is the Education Development Index, X_i is the ith indicator; L_{ik} is the factor loading value of the ith variable on the kth factor; E_k is the Eigen value of the kth factor. The

overall EDI is calculated based on the individual EDI calculations. At first, PCA is run for all the five dimensions and the weight for each dimension is determined.

Depth and severity of gaps in education indicators

The paper also measures the depth and severity of gaps in indicators related to educational performances and in education development indices across upazilas from the best performing upazila for the indicator under consideration. The depth of gap is defined as the average of the distances of the upazillas from the best performing upazilla. Therefore,

$$Depth_i = \frac{1}{j}\sum_j (1 - NV_{ij}) \qquad (3)$$

Where, $Depth_i$ is the average depth of gap of ith indicator and NV_{ij} is the normalised value of the ith indicator for the jth upazilla. The value of $Depth_i$ would lie between 0 and 1. The larger value of the depth implies larger average gap among the upazillas from the best performing upazilla.

In the calculation of $Depth_i$, all upazillas, whether they have small gaps or large gaps from the best performing upazillas, get equal weights. In order to assign higher weights to the higher gaps, the severity of gaps is calculated which is defined as the squared value of the depth of gaps. Therefore,

$$Severity_i = (Depth_i)^2 \qquad (5)$$

Where $Severity_i$ is the severity of gaps of ith indicator. The value of $Severity_i$ would lie between 0 and 1. The larger value of the severity implies larger weighted gap among the upazillas from the best performing upazilla.

III. Descriptive Statistics: Spatial Distributions of Indicators across Upazilas

This paper uses latest Annual School Survey Data of 2011. Education Management of Information System (EMIS) division of Directorate of Primary Education (DPE) under Ministry of Primary and Mass Education (MoPME) undertakes a census of all the primary schools of the country every year. So far they have published 4 censuses. The latest one was carried out in 2011 and this census covers all 11 types of primary schools including Madrashas (Ebtedayee) and Kindergarten.

In the process of EDI calculation, we use an imaginary upazila that have best values for all normalized indicators. Use of this technique allows us to measure the gap between the best performing 'real' upazilla from the best possible outcome. For example, Doublemuring upazilla of Chittagong appears as the best performing upazilla based on overall EDI. However, overall EDI score of Doublemuring is about 0.76 which implies that the best performing upazilla still needs to go far to attain the best 'achievable' outcome. Moreover, we do not have any upazilla that performs consistently well for all the indicators included in EDI calculation. Thus, the best performing upazilla in EDI calculation is determined by the weights to the indicators and top upazillas in the EDI ranking may not performed very well for all indicators and may perform very poor in some indicators.

Table 1 presents summary statistics of the indicators related to educational performances in upazilas. Despite indicators related to accessibility of schools suggest good scenarios, still about 20 percent schools are not easily accessible to the neighboring residents. To achieve the goal of 'a school per 2 square kilometre area' for make primary schooling easiliy accessible, a long way need to go. Only one-fifth of schools enjoys electricity access, while the importance of electricity in schools is getting prominence as students need to be introduced with multimedia now-a-days. Class rooms at the primary schools in Bangladesh are quite crowded, the student-room ratio is 38. Student-teacher ratio is also very high, implying crowded class room with less possibility of student teacher interaction. Still a significant proportion of teachers in primary schools are without bachelor degree and teachers with bachelor degree need to be increased for quality schooling. Interms of gender parity at the primary school enrolment, not all upazilas has achieve the gender parity; girls enrolment in some upazilas is, even, higher than boys which ensures gender parity at the national level, though.

Ministry of education set a target that female teachers ratio should be above of 60 percent. The obsereved female teacher ratio in the data is about 53 percent and thus it requires renewed efforts to reach at the goal. Another important indicator related to gender equity is percent of schools with girls separate toilet. The recent data shows, only two-fifth of schools have seperate toilet for girls. Despite Bangladesh achieves tremendous success in primary school enrollemnt, pass rate at grade V and school attendance rate are below 90 percent. On average one out of ten students need to repeate the same class and one out of twenty studnets drops out from school. Therefore, still there is much need to be done to stop children' dropping out from schools.

Table 1: Summary Statistics of Indicators used in EDI Calculation

Main Indicators used in EDI calculation	Mean (N-483)	Std. Dev.	Min	Max
Schools per two square kilometers	0.76	0.26	0.04	1
Schools with easy access (%)	80.6	26.59	0	100
Schools with safe water (%)	95.83	12.05	16.33	100
Schools with electricity (%)	21.61	19.54	0	100
Toliet per hundred students	1.45	0.41	0.43	2
Schools with better room situation (%)	72.92	10.96	39.06	100
Student-room ratio	38.19	15.27	10.18	100
Student-teacher ratio	47.06	13.04	12.14	91.21
Ratio of teachers with graduation	65.3	10.93	14	100
Schools with chak and board (%)	96.77	7.48	29.76	100
Percent of girls among total students	50.17	1.88	45.51	57.33
Percent of female teacher among teachers	52.98	11.50	15.80	88.42
Schools with girls' seperate toilet (%)	39.23	19.15	0	100
Gender equity in drop out rate	2.15	1.64	0	12.06
Gross enrollment ratio	94.78	10.48	28.84	100
Pass rate in grade V	87.47	6.37	62.11	100
Attendence rate	85.74	2.84	71.78	100
Dropout rate	5.37	2.78	0	14.28
Repeater's rate	11.43	5.05	0	33.1

Source: Primary school survey, 2011

Table 2 provides descriptive statistics and quantile distribution of the normalized indicators. Among the two Access indicators, the 'school per 2 squuare kilometer' has an average value (0.75), suggesting few of the upazillas performs poorly in terms of this indicator. Even 50th percentile of the upazillas has the indicator value of 0.835, implying that the performance of most of the upazillas are very good in terms of access. The other access indicator, the 'Accessibility of school' has a average value more than 0.8, suggesting that the performance of the upazillas in term of this indicator is, on average, around 80 percent of the best performing upazilla. The indicator value at the 25th percentile is 0.70, suggesting that the performance of most of the upazillas is indeed good. In the case of five Infrastructure indicators, the 'school with safe water' has the highest average and the 'school with electricity' has the lowest average. Among the five Infrastructure indicators, the best performance is observed for the 'school with safe water' as even at the 25th percentile the indicator value is 0.98. In contrast, poor performance is observed for 'school with electricity', school with toilet per hundred students',

and 'room size per student' since even at the 75th percentile the index values are very low. The performance of 'average room condition' is moderate.

For the three Quality indicators, 'availability of teaching-learning materials' has the highest average value and the 'population adjusted teacher-student ratio' has the lowest value. The performance of most of the upazilla in term of the 'Distance from optimal range of student-teacher ratio' is extremely bad; whereas the performance is very good in the case of 'learning materials' and reasonably good in the case of 'qualification of teachers'.Among the four Gender Equity indicators, 'gender equity in the dropout ratio' has the highest average value and 'schools having separate toilets for girls' has the lowest average value. The performance in terms of 'share of girls in total number of students', 'share of female teachers in total number of teachers' and 'gender equity in dropout rate' are reasonably good, whereas the performance is very bad in term of 'schools having separate toilet for girls'. Finally, among the five outcome indicators, 'gross enrolment ratio' has the highest average value and 'attendance rate' has the lowest average value. In terms of quantile distribution, the performance if very good in the case of 'gross enrolment', whereas the performance is moderate in cases of other four indicators.

Table 2: Descriptive Statistics of the Normalised Indicators

Indicators of Primary Educational Development	Mean (N=483)	Std. Dev.	25th	50th	75th
Access: Schools per two square kilometers	0.75	0.27	0.54	0.84	1.00
Access: Accessibility of schools	0.81	0.27	0.71	0.93	1.00
Infrastructure: School with safe water	0.95	0.14	0.98	1.00	1.00
Infrastructure: School with electricity	0.22	0.20	0.07	0.16	0.30
Infrastructure: School with toilet per 100 students	0.65	0.26	0.43	0.62	0.93
Infrastructure: Average room condition of the school	0.56	0.18	0.44	0.56	0.69
Infrastructure: Distance from optimal student-room ratio	0.81	0.17	0.74	0.85	0.92
Quality: Distance from optimal student-teacher ratio	0.77	0.21	0.65	0.80	1.00
Quality: Qualification of teachers	0.60	0.13	0.55	0.62	0.67
Quality: Availability of teaching-learning materials	0.95	0.11	0.96	0.98	1.00
Equity: Distance from the proper share of girls among students	0.80	0.17	0.73	0.85	0.92
Equity: Distance from the proper share of female teachers	0.75	0.17	0.64	0.78	0.90
Equity: Schools having separate toilet for girls	0.39	0.19	0.25	0.36	0.51
Equity: Gender equity in dropout rate	0.80	0.17	0.75	0.84	0.92
Outcome: Gross enrolment ratio	0.93	0.15	0.90	1.00	1.00
Outcome: Pass rate at grade five	0.67	0.17	0.58	0.71	0.79
Outcome: Attendance rate	0.49	0.10	0 .44	0.50	0.56
Outcome: Dropout rate	0.62	0.19	0.49	0.62	0.75
Outcome: Repetition rate	0.65	0.15	0.57	0.68	0.76

Source: Author's own calculation

We also have examined the kernel densities of normalized education indicators to asses the pattern and shape of the distribution. The Kernel distributions of the normalised indicators used in the calculation of the EDI are presented in Figure 1. The top-left panel in Figure 1 presents the Kernel distribution graphs of two Access indicators. It appears that the distribution pattern of both 'school per thousand population' and 'school with easy access' indicators are skewed to the right suggesting most of the upazillas are close to the best performing upazilla. The Top-center panel in Figure 1 presents the Kernel distribution graphs of five Infrastructure indicators. The distribution pattern on 'school with safe water' is highly skewed to the left, suggesting most of the upazillas are highly close to the best performing upazilla. In contrast, 'school with electricity' is skewed to the right, indicating that most of the upazillas are far away from the best performing upazillas. The 'school with better rooms' indicator has a normal distribution shape with a mean around the 0.5; which means, almost half of the upazllas are close to the best performing upazilla whereas the remaining half are close to the worst performing upazilla. The kernel density of 'School with toilet per hubdred studnets' implies most upazillas are performing above average; while the kernel density of 'distance from optimal student-room ratio' is skewed to the left suggesting most upazillas are to the best performance.

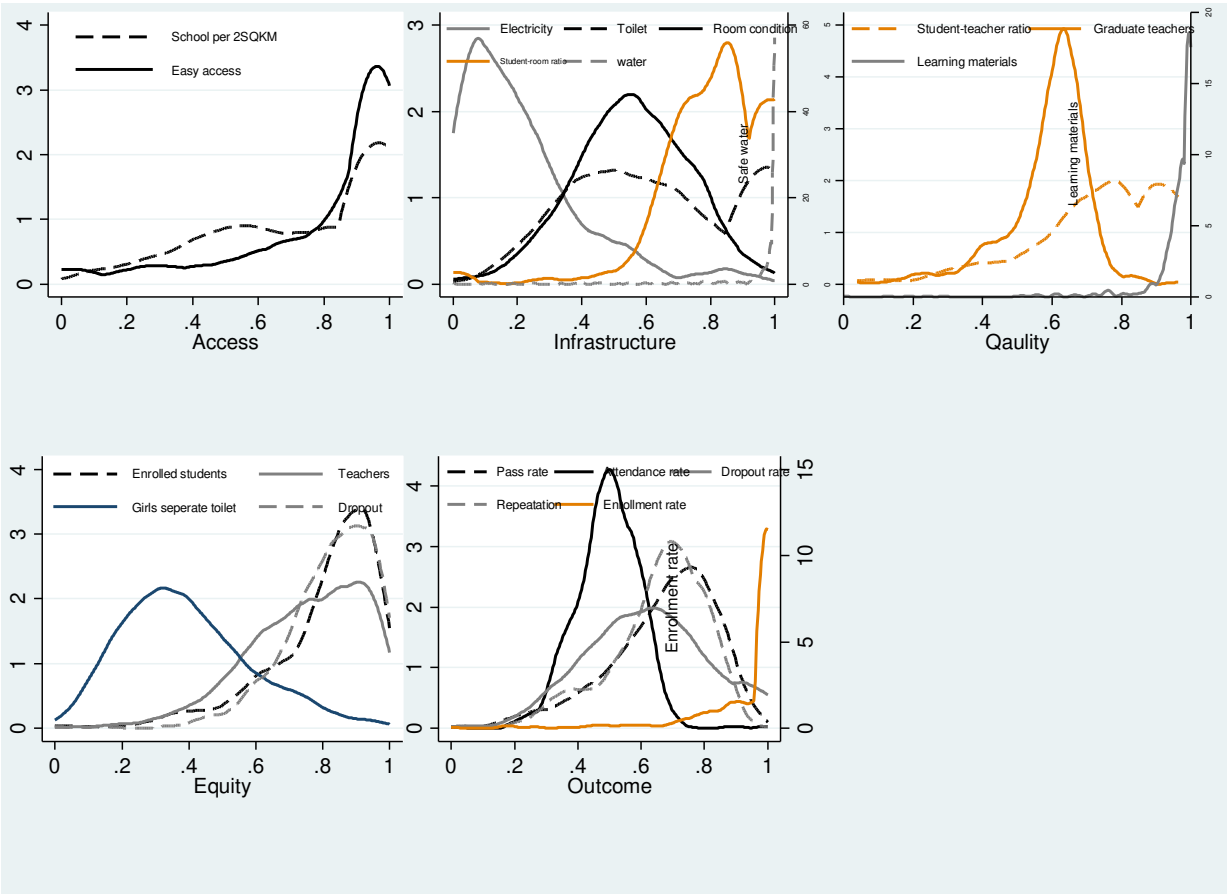
The top-right panel of Figure 1 presents the Kernel distribution graphs of three Quality indicators. 'Adjusted teacher-student ratio' indicator is highly skewed to the right, suggesting that most of the upazllas are very far from the best performing upazilla. In contrast, 'learning materials' has a distribution pattern very highly skewed to the left, i.e., most of the upazillas are very close to the best performing upazilla. The other indicator 'teachers with graduation' has a distribution with some skewness to the left. That means a large number of upazillas are close to the best performing upazilla.

In the bottom-left panel of Figure 1, the Kernel distribution graphs of four Gender Equity indicators are presented. Three indicators, namely 'share of girls in total students', 'share of female in total teachers' and 'gender equity in dropout' have distribution largely skewed to the left, implying large number of the upazillas are close to the best performing upazilla. However, distributions of all these three indicators have long tails towards the worst performing upazilla, suggesting a good number of upazillas are actually close to the worst performing upazilla. The other indicator, 'schools with girls' separate toilet' has a distribution with some skewness to the right, indicating large number of upazillas are close to the worst performing upazilla.

Finally, the bottom-center panel of Figure 1 presents the Kernel distributon graphs of five Outcome indicators. The 'gross enrolment ratio' indicator is highly skewed to the left, implying

most of the upazillas are very close to the best performing upazilla. 'Pass rate in grade V' and 'repetition rate' indicators have distribution pattern largely skewed to the left, indicating that a large number upazillas are close to the best performing upazilla. However, both these indicators have long tails towards the worst performing upazilla, suggesting a good number of upazillas are actually far away from the best performing upazilla. The other two indicators, 'attendance rate' and 'dropout rate' have largely normal distribution shapes with means between 0.55 and 0.62 respectively, though the deviation from the mean is much higher for the 'dropout rate' indicator.

Figure 1: Kernel Densities of Normalized Indicators



IV. Construction and Distribution of EDIs and its Components

Weights of relevant indicators in EDI construction

Using the method described in Section III, the weights of different indicators in the calculation of EDIs are derived. Table 3 presensts the weights of indicators in the calculation of different sub-EDIs and the overall EDI. In access EDI, it appears that the 'schools per thousand population' derived arournd 38 percent weights, whereas the other indicator, 'accessibility of

school' gets only 62 percent weights. The weights of the five indicators in consutructing the Infrastructre EDI are in the second sub-section in the Table. The largest weight is for the 'school with toilet per 100 students' followed by 'room size per student', and the lowest weight is for the 'average room condition of the school'. The third sub-section in the table presents the weights of the three indicators in consutructing the Quality EDI. The largest weight is for the 'availability of teaching-learning materials', and the lowest weight is for the 'population adjusted teacher-student ratio'. The weights of the four indicators in constructing the Gender Equity EDI show that the largest weight is for the 'Schools having separate toilet for girls' and the lowest weight is for the 'share of female teachers in total number of teachers'. The weights of five indicators in constructing the Outcome EDI are almost evenly distribued. The largest weight is for the 'dropout rate' (0.27) and the lowest weight is for the 'gross enrolment ratio' (0.15).

Table 3: Weights in Calculating Access EDI

Indicators	Weights (percent)
Access	
Schools per thousand populations	38.42
Accessibility of schools	61.58
Infrastructure	
School with safe water	17.39
School with electricity	18.93
School with toilet per 100 students	25.27
Average room condition of the school	16.13
Room size per student	22.29
Qaulity	
Population adjusted teacher-student ratio	30.04
Qualification of teachers	33.43
Availability of teaching-learning materials	36.53
Gender Equity	
Share of girls in total number of students	24.24
Share of female teachers in total number of teachers	21.53
Schools having separate toilet for girls	30.26
Gender equity in dropout rate	23.97
Outcome	
Gross enrolment ratio	15.18
Pass rate at grade five	20.46
Attendance rate	20.48
Dropout rate	26.98
Repetition rate	16.91
Overall EDI	
Access EDI	32.89
Infrastructure EDI	16.20
Quality EDI	16.66
Gender Equity EDI	17.82
Outcome EDI	16.43

Source: Authors' own calculation

Finally, all the five different sub EDIs-Access EDI, Infrastructure EDI, Quality EDI, Gender Equity EDI and Outcome EDI-are used to construct the Overall EDI. The largest weight is for

the Access EDI and lowest weight is for the Infrastructure EDI. Excluding access EDI, all other sub EDIs are almost equally weighted in the construction of overall EDI.

Distribution of overall EDI and its sub-components

The results of the constructed EDIs are presented in the Annex. Figure 2 presents the Kernal distribution graphs of different EDIs. The Access EDI, Quality EDI and Outcome EDI appear to be skewed to the left implying that the most of the upazillas are close to the best performing upazilla. The Infrastructure EDI, Equity EDI and Overall EDI appear to be symmetric suggesting large numbers of upazillas are close to the moderate performing upazilla. However, all these three EDIs have long tail towards the worst performing upazilla, indicating that the there are a good number of upazilla who have bad performances. Finally, the distribution of the Overall EDI has a relatively normal distribution shape with fat tail on the left side.

Figure 2: Kernel Distribution Graphs of Different EDIs

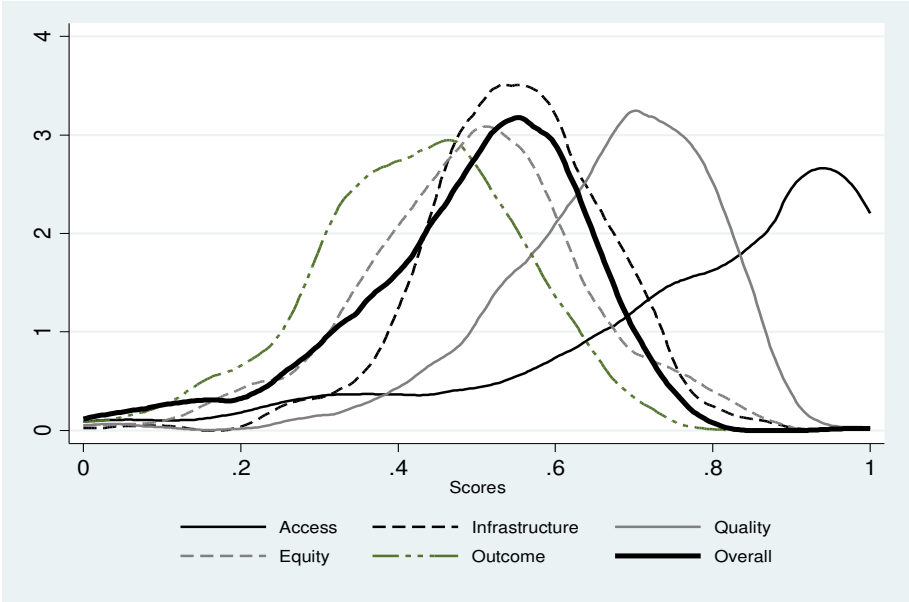


Table 4 presents the quantile distribution of different EDIs. Most of the upazillas perform very well in the cases of Access EDI and quality EDI, since even the 25th percentile upazillas has the indicator value of around 0.58 or up. In the case of Quality EDI, the 25th percentile upazilla has a value of 0.58, suggesting some good performance at the lower ranked upazialls. However, there is not much improvement in this EDI while movement from 25th percentile to 75th percentile is considered as the index value increases from 0.58 to 0.76. In the cases of Equity EDI and Outcome EDI, the performaces of the upazillas are moderate. Finally, in the case of overall EDI, the performance is also moderate.

Table 4: Distribution of EDIs

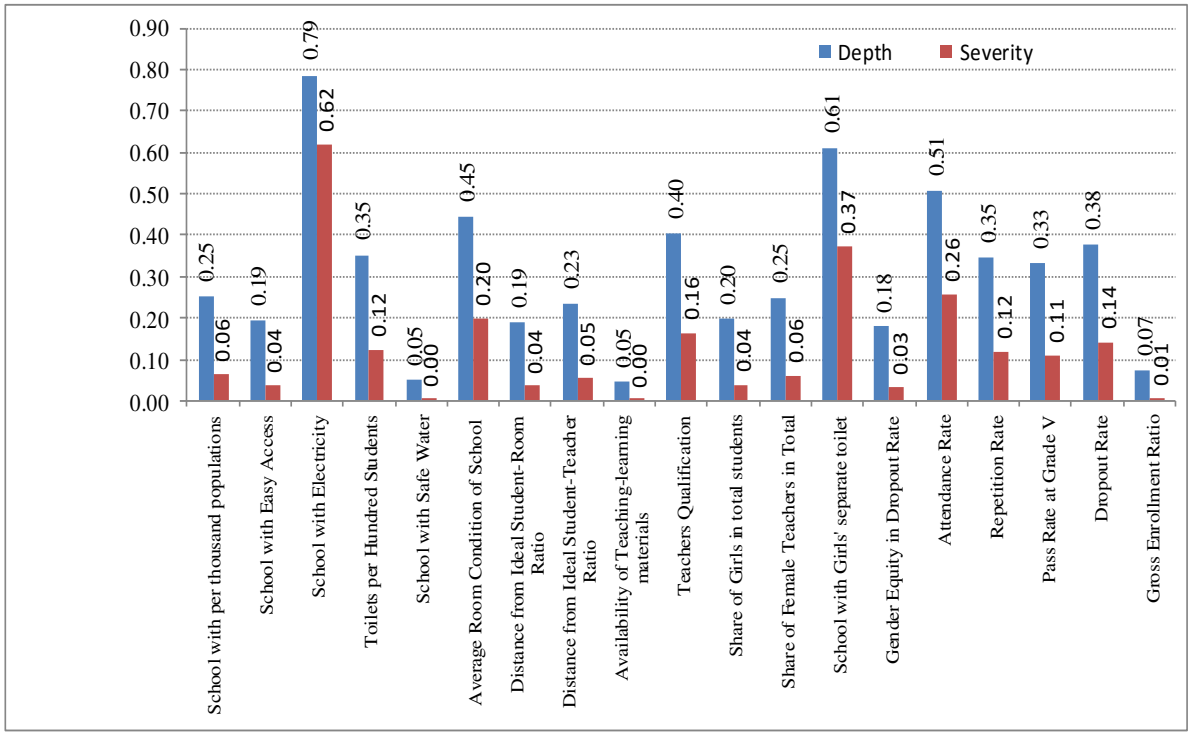
EDIs	Mean	Std. Dev.	p25	p50	p75	p99
Access	0.78	0.23	0.68	0.84	0. .9572	1.00
Infrastructure	0.55	0.12	0.48	0.55	0.62	0.83
Quality	0.67	0.14	0.58	0.68	0.76	0.88
Equity	0.50	0.14	0.41	0.50	0.58	0.83
Outcome	0.42	0.14	0.34	0.43	0.51	0.70
Overall	0.49	0.15	0.42	0.51	0.60	0.74

Source: Authors' own calculation

Depth and severity of gaps in education indicators and in EDIs

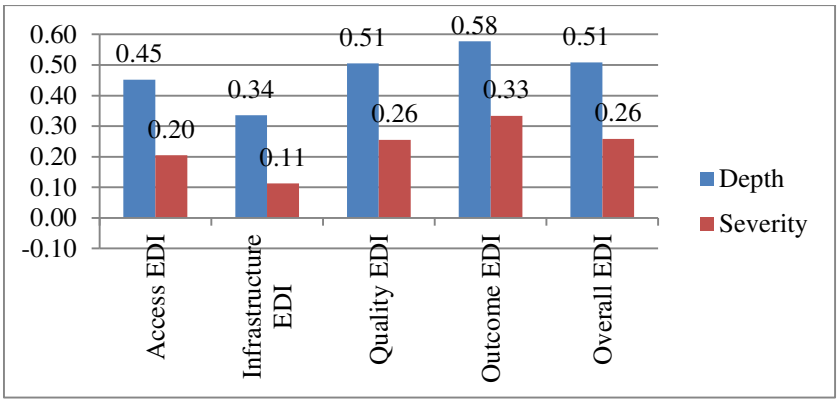
Figure 3 presents the calculated depth and severity of gaps of different indicators. The largest depth and severity of gaps are observed in the case of school with electricity. The second largest depth and severity of gaps are observed for 'school with girls' separate toilet' and the third largest depth and severity of are observed for 'attendance rate'. In contrast, the lowest depth and severity of are observed for 'availabity of teaching learning materials' and for 'school with safe water'. Figure 4 shows the depth and severity of gaps of different EDIs. The largest depth and severity of gaps are observed for the Outcome EDI followed by Quality EDI. The lowest depth and severity of gaps are observed for the Infrastructure EDI.

Figure 3: Depth and Severity of Gaps in Education Indicators



Source: Authors' own calculation

Figure 4: Depth and Severity of Different EDIs



Source: Authors' own calculation

V. Performance of Upazilas in Primary Education: EDIs across Upazilas

We present the constructed EDIs into the map of Bangladesh to identify if there is any cluster of upazilas are performing poorly. First, we will discuss the sub EDIs to get the idea of lagging regions interms of access, infrastructure, quality, and outcome. Then, we will analysze the composite EDI. Figure 5 presents the access and infrastructure related EDIs of upazilas in the Bangladesh upazila map. In terms of access EDI, most upazilas are perfoming in the middle range (0.4-0.6), suggesting a significant scope of improvement in terms of accessibility of schools. However, the upazilas around the 'haor' regions in Sylhet division and in greater Mymensingh district and the upazilas from Chittagong Hill Tracts (CHT) are lagging behind other upazilas seriously in terms of accessibility. Some other upazilas along the Jamuna River and the Padma River are also performing poorly. While improvement of accessibility of schools is necessary for most upazilas, these lagging upazilas warrant special attention for their natural reality. Table 5 shows that out of bottom ten upazilas in access EDI are from Chittagong Hill Tracts. The exception is Astogram upazila which is from Kishoreganj, and located at the haor region. Upazilas located in the metropolitan areas perform well in terms of accessibility. Three upazilas from Sylhet districts and two upazilas from each of the Dhaka district and the Rajshahi districts are in the top 10 performing upazilas in terms of access EDI.

While the patterns of infrastructure EDIs are similar to the access EDIs, upazilas around the country perform even poorly in terms of infrastructural development in primary education. A many number of upazilas are in the lower middle range (0.2-0.4) of infrastructure EDIs and most them are situated in the Chittagong Hill Tracts and in the greater Mymensinh district. Upazilas in the south west coastal region and along the upper Jamuna River in Rangpur division

are also perform poorly. Table 5 also shows that upazilas in the bottom ten are from 'haor' regions or from coastal regions.

Figure 5. Access and Infrastructure EDIs are presented in the map.

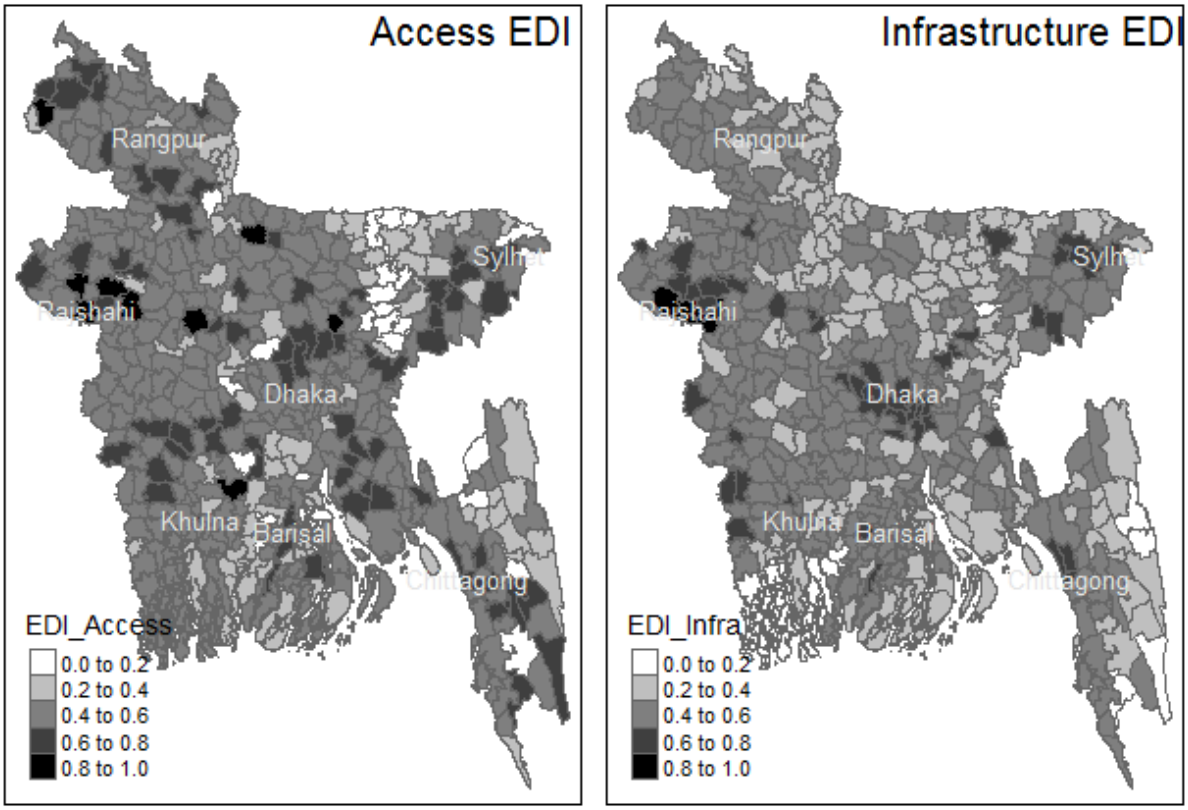
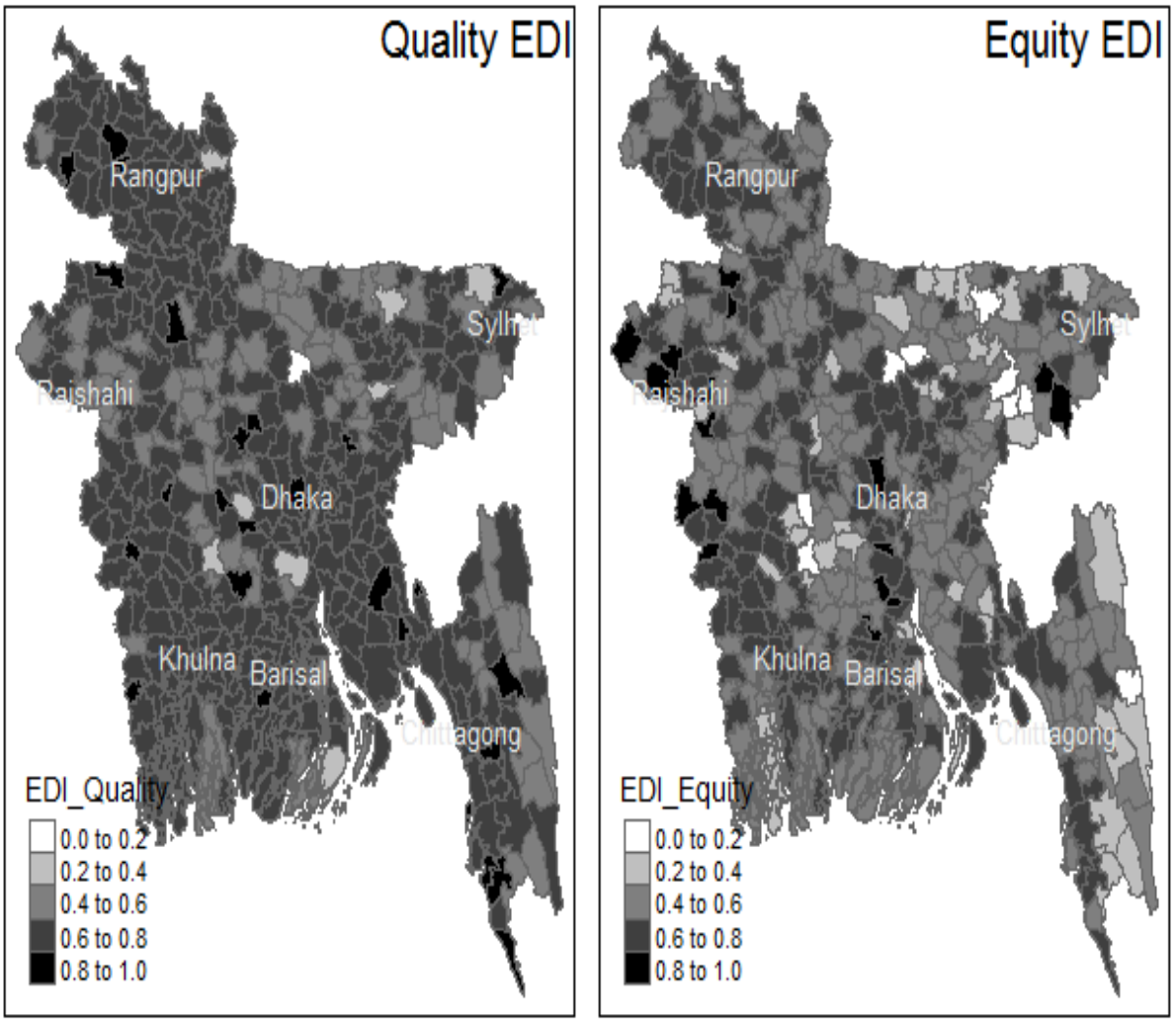


Figure 6 presents EDIs derived from indicators related quality and equity in Bangladehs map. From the map, some important observations can be made. In terms of quality EDI, most upazilas are performing in the upper middle range (0.6-0.8) and only few upazilas are in the top quintile of quality EDI. Infact, quite a few upazilas are in the lower middle range (0.2-.40) of quality EDIs. Most of the top ten performing upazilas are from metropolitan areas; Saidpur of Nilphamari, Akkelpur of Jaipurhat, and Fakirhat of Bagerhat are the exceptions. Trishal upazilla in Mymensingh district is at the bottom of the ranking. There is a need for quality improvement across the country, while some upazilas require more attention.

In terms of equity EDI, most upazilas in Bangladesh are performing in the lower middle of the ladder (0.4-0.6). Some upazilas perform even poorly. Therefore, despite the level of gender equity in the primary education at the national level is satisfactory and has drawn attention from development economists significantly, still long way to go. Gender parity in primary education has to be increased in the upazilas with low equity EDI. Like the access EDI, upazilas

from haor regions are performing poorly in gender equity. Therefor, it can be the case that poor access may deter girls more materializing the benefits of Primay School. Quite understandably, upazilas from the urban areas are among the top performing upazilas in terms of equity EDI.

Figure 6. Quality and Equity EDIs are presented in the map.



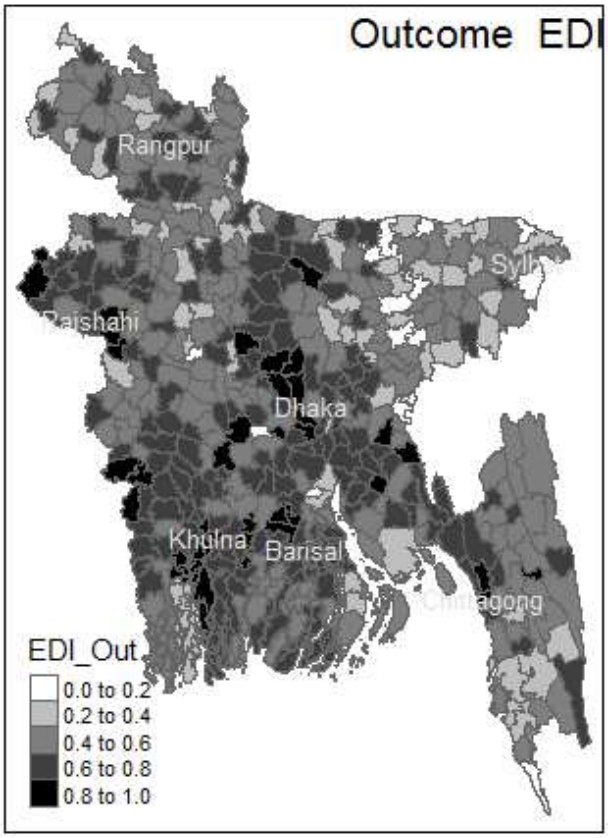
Outcome EDIs are presented in the map of Figure 7. The map shows that most upazilas are performing in the middle rang or upper middle range of outcome EDIs, implying a room for improvement for all upazilas in terms of outcome. Upazilas from the hoar region, from the Chittagong Hill Tracts, and from the poverty-striken north Bengal are performing poorly in terms of outcome EDI. Table 5 shows that, except two upazilas-Teknaf of Cox's Bazar and Damudda of Hobiganj, eight upazilas of bottom ten performing upazilas are from the 'Haor' region. Savar in Dhaka district is at the top in Outcome EDI, whereas, Astogram upazilla in Kishorgonj district is at the bottom of the ranking.

Table 5: Top Ten and Bottom Ten Upazillas in Access EDI

Top 10 Upazillas				Bottom 10 Upazillas			
Upazilla	District	score	Rank	Upazilla	District	score	Rank
Access EDI							
Kotwali	Dhaka	1.000	1	Astogram	Kishoreganj	0.159	474
Shibpur	Norsingdi	1.000	1	BarkalL	Rangamati	0.118	475
Mirerswarai	Chittagong	1.000	1	Ruma	Bandarban	0.104	476
Durgapur	Rajhshahi	1.000	1	Baghaichari	Rangamati	0.042	477
Lowhajang	Munshiganj	1.000	1	Langadu	Rangamati	0.040	478
Bishwanath	Sylhet	1.000	1	Ramgarh	Khagrachari	0.036	479
Baghmara	Rajhshahi	1.000	1	Bilaichari	Rangamati	0.029	480
Ramna	Dhaka	1.000	1	Naniarchar	Rangamati	0.022	481
Bianibazar	Sylhet	1.000	1	Jurachari	Rangamati	0.019	482
Golapgonj	Sylhet	1.000	1	Lama	Bandarban	0.000	483
Infrastructure EDI							
Kotwali	Dhaka	0.870	1	Kamalnagar	Laxmipur	0.277	473
Boalia	Rajshahi	0.851	2	Sundarganj	Gaibandha	0.275	474
Khulna S.	Khulna	0.834	3	Manpura	Bhola	0.272	475
Meherpur S.	Meherpur	0.833	4	Itna	Kishoreganj	0.264	476
Fenchuganj	Sylhet	0.818	5	Kurigram S.	Kurigram	0.262	477
Doublemuring	Chittagong	0.795	6	Nageswari	Kurigram	0.246	478
Keraniganj	Dhaka	0.783	7	Barkal	Rangamati	0.246	479
Kotwali	Chittagong	0.773	8	Kuliarchar	Kishoreganj	0.240	480
Sutrapur	Dhaka	0.772	9	Mongla	Bagerhat	0.086	481
Mohammadpur	Dhaka	0.769	10	Mithamoin	Kishoreganj	0.085	482
Quality EDI							
Dhanmondi	Dhaka	0.941	1	Itna	Kishoreganj	0.311	474
Saidpur	Nilphamari	0.889	2	Nagarkanda	Faridpur	0.310	475
Akkelpur	Jaipurhat	0.886	3	Ukhiya	Cox's Bazar	0.299	476
Fakirhat	Bagerhat	0.883	4	Phulpur	Mymensingh	0.294	477
Dinajpur S.	Dinajpur	0.875	5	Bajitpur	Kishoreganj	0.276	478
Dounlemuring	Chittagong	0.873	6	Harirampur	Manikganj	0.235	479
Dakope	Khulna	0.872	7	Charfashion	Bhola	0.085	480
Kahaloo	Bogra	0.869	8	Mithamoin	Kishoreganj	0.052	481
Tejgaon	Dhaka	0.866	9	Kurigram s.	Kurigram	0.006	482
Narail S.	Narail	0.859	10	Trishal	Mymensingh	0.000	483
Equity EDI							
Mirpur	Dhaka	0.847	1	Shapahar	Naogoan	0.177	473
Gournadi	Barisal	0.843	2	Baniachang	Hobiganj	0.175	474
Sutrapur	Dhaka	0.836	3	Rajbari S.	Rajbari	0.168	475
Jiban Nagar	Chuadanga	0.830	4	Porsha	Naogoan	0.162	476
Demra	Dhaka	0.829	5	Hakimpur	Dinajpur	0.155	477
Lowhajang	Munshiganj	0.826	6	Roangchari	Bandarban	0.146	478
Shariatpur S.	Shariatpur	0.809	7	Chowhali	Sirajgonj	0.121	479
Bagha	Rajshahi	0.805	8	Jamalganj	Sunamganj	0.113	480
Puthia	Rajshahi	0.796	9	Bahubal	Hobiganj	0.051	481
Gulshan	Dhaka	0.792	10	Jurachari	Rangamati	0.044	482
Outcome EDI							
Savar	Dhaka	0.749	1	Dharampasha	Sunamganj	0.116	473
Moheshpur	Jhenaidah	0.721	2	Barahatta	Netrokona	0.111	474
Batiaghata	Khulna	0.710	3	Itna	Kishoreganj	0.111	475
Dohar	Dhaka	0.698	4	Lakhai	Hobiganj	0.108	476
Agailjhara	Barisal	0.689	5	Damudda	Shariatpur	0.100	477
Charaghat	Rajshahi	0.688	6	Kashba	Brahman Baria	0.094	478
Faridpur S.	Faridpur	0.687	7	Teknaf	Cox's Bazar	0.048	479
Sharsha	Jessore	0.682	8	Akhaura	Brahman Baria	0.044	480
Kaliakoir	Gazipur	0.679	9	Jaintapur	Sylhet	0.011	481
Chowgacha	Jessore	0.678	10	Astogram	Kishoreganj	0.009	482

Source: Author's own calculation

Figure 7. Outcome EDIs are presented in the map.



Now, we will move to the discussion of spatial distribution of overall EDI scores. Overall EDI is the weighted index of all five sub-component EDIs with the weights generated from principal component analysis. The map presented in figure 5 depicts the spatial distribution of composite EDI. The map shows that very few upazilas are in highest range (0.8-1.0) of EDI. In fact not may upazilas are in the rang of 0.6-0.8 of EDI score. Most upazilas are centered on the range of 0.4 to 0.6. Most of the top ten upazilas, presented in Table 6, are from large metropolitan areas such Dhaka, Chittagong or Khulna. Lowhajong of Munshiganj and Shibpur of Norsingdi are only the exceptions and these upazilas are also located in close proximity to the capital, the Dhaka city. Upazilas in the 'haor' region of Sylhet division and greater Mymensinh districts and upazilas from the CHT are seriously lagging behind all other upazilas in terms primary education development. All the bottom ten upazilas are either from the 'haor' region or from the CHT (Table 6). Though the desnity in the CHT is less, the upazilas in the 'haor' region are home of significant portion of population of the country. Thus, these lagging regions warrant special attention to improve the overall development of primary education. These regions are

lagging behind mostly for less accessibility of schools and the issue of easy access is, thus, need to be addressed.

Figure 8. Overall EDIs are presented in the map.

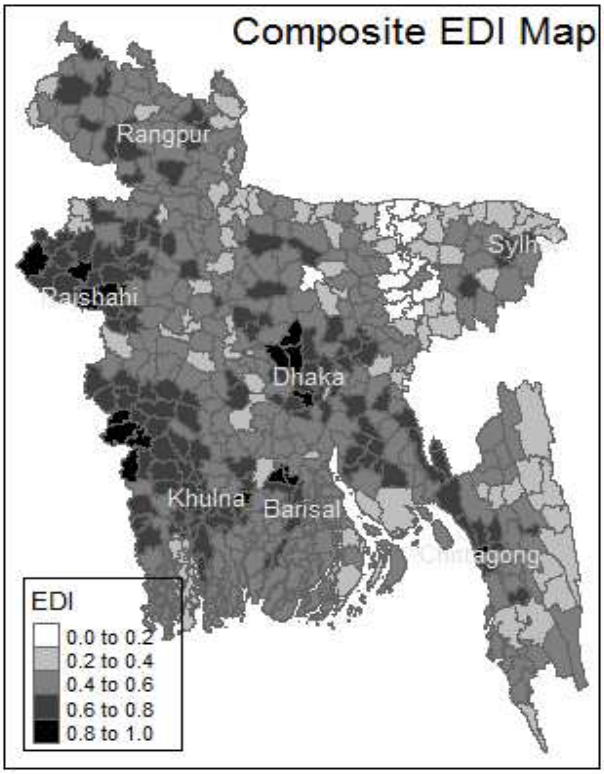


Table 6: Top 10 and Bottom 10 Upazillas in Overall EDI

Top 10 Upazillas				Bottom 10 Upazillas			
Upazilla	**District**	**Score**	**Rank**	**Upazilla**	**District**	**Score**	**Rank**
Doublemuring	Chittagong	0.763	1	Barkal	Rangamati	0.100	474
Sutrapur	Dhaka	0.760	2	Roangchari	Bandarban	0.072	475
Gulshan	Dhaka	0.748	3	Langadu	Rangamati	0.070	476
Savar	Dhaka	0.741	4	Lama	Bandarban	0.057	477
Demra	Dhaka	0.740	5	Itna	Kishoreganj	0.055	478
Lowhajang	Munshiganj	0.739	6	Bilaichari	Rangamati	0.042	479
Kotwali	Dhaka	0.738	7	Ruma	Bandarban	0.034	480
Khulna S.	Khulna	0.733	8	Mithamoin	Kishoreganj	0.017	481
Shibpur	Narshingdi	0.719	9	Astogram	Kishoreganj	0.013	482
Mohammadpur	Dhaka	0.718	10	Jurachari	Rangamati	0.000	483

Source: Author's own calculation.

VI. Concluding Remarks

This paper addresses the issue of spatial divergence in educational performances in primary education sector through the construction of education development index (EDI). The paper uses principal component analysis to generate weights for indicators used in the construction of multidimensional general EDI. The paper uses comprehensive list of indicators to develop

the EDI. It has been found that upazilas are perofrming poorly in general interms of access, infrastructure, and outcome. Although most upazilas are crowded at the middle of the distribution for each EDIs, there are many upazilas from certain regions are seriously lagging in terms educational performance in the primary education sector. While upazilas from metropolitan areas perform very well and remain at the high range of each EDIs, typically in btween 0.8 and 1.0; upazilas from the 'haor' region, the Chittagong Hill Tracts (CHT), the coastal region and the regions along the Jamuna River perform poorly and remain at the very bottom range of each EDIs, usually in between 0.0 to 0.2. Thus, the policy makers need to give special attention to these regions while formulating policies in channeling resources for primary education development.

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Annex-A

Description of the indicators is provided below:

I. Access EDI

1.1. Schools per thousand populations: Upazilla wise populations from 2001 census have been updated for the year 2011 using the common national population growth rate. Numbers of schools in upazilla are available in the 2011 school survey data, these two sets of information are used to calculate the number of school per thousand populations.

1.2. Accessibility of schools: Question about accessibility of school was asked in the 2011 school survey. This variable is computed considering schools with 'easy access' as a percentage of the sum of schools with 'easy access' and schools with 'difficult access' in an upazilla.

II. Infrastructure EDI

2.1. School with safe water: Question about sources of water was asked in the 2011 school survey. Here, arsenic free tube-well and piped water are considered as sources of safe water. Then this variable is computed considering schools with safe water as a percentage of total number of schools in an upazilla.

2.2. School with electricity: Question about availability of electric fan was asked in the 2011 school survey, and in this study, availability of electric fan is considered as a proxy for the availability of electricity. This variable is computed considering schools with electric fan as a percentage of the sum of schools with electric fan and schools with no electric fan in an upazilla.

2.3. School with toilet per 100 students: Question about availability of toilet and number of toilets were asked in the 2011 school survey. This variable is computed considering average number of toilets per 100 students in an upazilla.

2.4. Average room condition of the school: In the 2011 school survey, question was asked about condition of each room in the school. This study averaged the ratings for all rooms in a school. If average rating of a school was less than 2, which meant average room situation was satisfactory, that school was considered as a school with better room condition. Finally, the variable is computed considering schools with better room condition as a percentage of the total number of schools in an upazilla.

2.5. Distance from the Ideal Student-Rom ratio: There is information on the total available class rooms of a school in the survey. Using this information, we calculate student-room ratio. Then

absolute distance from the ideal student room ratio (35-45) is calculated. The school level average figures are finally normalised and averaged for an upazilla.

III. Quality EDI

3.1. Distance from the Ideal Student-Teacher ratio: This variable is computed considering the number of students as ratio of number of teachers in an upazilla.Then absolute distance is measured from the ideal student-teacher ratio (30-40) and averaged for an upazilla.

3.2. Quality of teachers: This variable is computed considering the number of teachers with graduation as a percent of total number of teachers in a school, and the calculated ratios are averaged for each upazilla.

3.3. Availability of teaching-learning materials: In the school survey 2011, there was a question on whether schools had chalks and black-board. This variable is computed considering schools with chalks and black-board as a percentage of the total number of schools in an upazilla.

IV. Gender Equity EDI

4.1. Distance from Ideal Gender Equity in terms of girls' share in total number of students: The shares of girls in total number of students for all schools are calculated. Then absolute distance from ideal gender equal situation (0.5) is calculated and then averaged for each upazilla.

4.2. Distance from Ideal female teacher ratio in total number of teachers: The shares of female teachers in total number of teachers for all schools are calculated. Then absolute distance from ideal figure (0.6) is calculated and then averaged for each upazilla.

4.3. Schools having separate toilet for girls: In the school survey 2011, schools were asked whether they had separate toilet for girls. This variable is computed considering schools with separate toilets for girls as a percentage of the total number of schools in an upazilla.

4.4. Gender equity in dropout rate: The difference between the dropout rates of boys and girls in an upazilla is calculated. Then zero difference is considered as the best value (no gender disparity in dropout rate), and the absolute distance from zero is considered to be the measure of gender equity in dropout rate.

V. Outcome EDI

5.1. Gross enrolment ratio: The numbers of children of age between 5 and 9 from the estimated population data for each upazilla are considered. Then, the total enrolled students in classes from KG to class 4 for each upazilla from the school survey are aggregated. Finally, the gross enrolment ratio is calculated by dividing the number of enrolled students by the number of children. Here gross enrolment rate 100 is treated as the maximum possible value, and all values above 100 are also considered as 100.

5.2. Pass rate at grade five: Averaged pass rate in grade V for all schools in an upazilla.

5.3. Attendance rate: Averaged attendance rates for each school during February and March of 2011 are calculated from the data of school survey 2011. Then these school averages are averaged for each upazilla.

5.4. Dropout rate: From the school survey 2011 data, dropout rates for all schools are calculated, and then these school averages are averaged for each upazilla.

5.5. Repetition rate: From the school survey 2011 data, Repetition rates for all schools are calculated, and then these school averages are averaged for each upazilla.