PRCPB Working Paper No. 7

Spatial Inequality in Social Progress in Bangladesh

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May 2005

The authors gratefully acknowledge the useful comments received from David Hulme, Bob Baulch and Karen Moore of CPRC on the earlier draft of the paper. Comments received from several discussants of the dissemmination workshop of the first chronic poverty report of Bangladesh are also gratefully acknowledged.

Spatial Inequality in Social Progress in Bangladesh

Abstract

The paper tracks spatial inequality in social progress in Bangladesh as evidenced from the district-level data. It uses a multivariate framework to explore the differential pace of social progress at the spatial level. The "instructive" outliers and deviants are identified in terms of underachievers and overachievers compared with the benchmark predicted by the level of aggregate affluence. The paper then draws upon discussions to coalesce a local contextual story about the possible reasons for such unexpected deviations from the general pattern. The paper concludes that the extent of spatial inequality in social development has decreased over the second half of the nineties although the overall level of inequality remains considerable. Policy implications are drawn for attacking spatial chronic poverty.

I. Introduction

Persistent spatial inequality has been long recognised both as the cause and as the effect of underdevelopment. Two lines of inquiry can be noted. The structuralist school of "dualism" (of different shades and inclinations) emphasizes that coexistence of different sets of conditions, of which some are "favoured" and others "disfavoured" is chronic and not merely transitional. The interrelations between the favoured and the disfavoured elements are such that the existence of the favoured elements does little or nothing to pull up the disfavoured elements, let alone "trickle down" to it. In fact, it may actually serve to push it down—to "develop its underdevelopment". One influential approach in this trend is represented by *geographic dualism* that dates back to Myrdal's (1957) hypothesis of "cumulative causation", which was advanced to account for the persistence of differences in a wide variety of development indices across nations and regions within nations. At the heart of such model lies the idea of increasing returns in the favoured region. Instead of leading to equality, forces of supply and demand interact with each other to produce cumulative movements away from spatial equilibrium. The emergence of multiple equilibria explains the persistence of spatial inequality and points to the need of "big push" type deep interventions for overcoming dualism.

The other line of inquiry sees dualism as a function of time, of stage of development, largely to be overcome in the process of development (modernisation) itself. According to this line of reasoning, higher wage in the favoured sector will attract surplus labour from the disfavoured region while falling rate of profit in the favoured region will be invested in the disfavoured region, leading to greater equalisation, as envisaged by the Lewis process. In this view, spatial inequality need not be chronic. Williamson (1965), for instance, shows that inter-regional inequality may actually follow an inverted-U curve, with 'pull' effects emanating from the favoured region being weak in the early stage of development and stronger in the later stages. Which of these processes will actually hold out at the end as the central tendency would depend on the relative strength of what Myrdal called 'backwash' as opposed to 'spread' effects, or Hirschman (1958) termed as 'polarisation' as against 'trickling down' effects. The actual outcome would depend on the variety of political, economic and social circumstances and is likely to exhibit considerable cross-country and cross-regional variation.

Which of these effects dominates the dynamics of spatial inequality in the Bangladesh context? This is the central question addressed in the present paper.

The recent resurgence in the theme of spatial inequality needs to be viewed in the light of above consideration. Bangladesh is no exception to this. Though the country is fairly small in terms of area coverage and relatively homogeneous in terms of ethnic composition, language and landscape, presence of geographic effects cannot be ignored. Persistence of geographical effects on income poverty has been noted previously in the Bangladesh context (GoB 1991; Ravallion and Wodon 1997; BIDS 2001). The present paper looks at the spatial inequality that exists in the country with regard to the key non-income dimensions of poverty and related social indicators. It attempts to explain the differentiation in the pace of social progress across regions and also identifies the "outliers" in this respect as well as possible causes underlying such deviant behaviour. The analysis of spatial inequality is based on the district level data for 1995 and 2000[1].

Structure of the paper

The paper is organised into six sections. After brief introductory remarks on "dulaist" framework that inform the persistence of spatial inequality in social progress, the second section describes the extent of spatial differences in social development (focusing on non-income dimensions of poverty and related social indicators) using district and division level data. The third section analyses the factors influencing the cross-district variation in social progress by pooling the 1995 and 2000 district level data. The fourth section identifies the districts which stand out among the rest as "over-achievers" and "under-achievers" (compared to the levels predicted by the level of their average affluence). The fifth section conjectures on possible triggers in terms of "deeper interventions" which may explain such deviant performance. The sixth section summarises the main results.

II. Spatial Variations in Social Progress

Spatial Trends in Human Poverty Index

Consistent with the theme of spatial inequality in "social progress", the focus of the paper is on deprivations in the non-income dimensions of well-being.[2] Among the indictors of the latter, the favoured candidate is the UNDP-proposed human poverty index (HPI), which has been supplemented by the analysis of some key social indicators such as under-five mortality rate, total fertility rate (TFR), net enrollment rate at the primary level. Human poverty focuses on three aspects of human deprivations: deprivation in longevity, deprivation in knowledge, and deprivation in economic provisioning.[3] These dimensions are given equal weights in the construction of HPI. Conceptually, the approach represented a step forward in capturing deprivations with respect to the key non-income dimensions of welfare. HPI focuses of the deprived segments of the population. This is consistent with the standard practice of confining

[1] There are 64 administrative districts in the country at the moment.

[2] The term "non-income" is, however, not synonymous to "non-economic". Thus, the human poverty index (HPI) considers "economic provisioning" (including public and private provisioning) as its constitutive element, which is not reducible to income. See Sen (1997) for the importance of distinguishing income inequality from economic inequality. Social indicators, however, can have important economic (as well as income growth) implications (as with basic education and reproductive health).

[3] For discussion of the underlying concept, see Anand and Sen (1996).

poverty measures exclusively to the deprived segments. The methodology for constructing the human poverty index (HPI) is provided in Table 1 along with the trends in human poverty in Bangladesh. The results show that the country has achieved notable progress in reducing human poverty over the past two decades. Thus, the incidence of human poverty has declined from 61.3 in 1981/83 to 47.2 in 1993/94, and dropped further to 41.8 in 1995/97 and 35.5 in 2000 according to the latest available data.

A significant variation has however been observed in terms of the value of HPI at the district level for both 1995 and 2000 (Table 2 and Map 1). While the value of national HPI was 41.8 in 1995/97, it ranged between 26.87 and 51.6 at the district level. Similarly, in 2000, it ranged between 25.40 and 42.98. It is noteworthy that all the districts have been able to improve its human poverty situation during the same period, but the rate of annual progress varies significantly (ranging from a negligible 0.1 per cent for Cox's Bazar to 4.6 per cent for Bandarban).

Exclusive focus on the aggregate index alone is, however, inadequate for at least two reasons. *First*, an aggregate index may not be a reliable guide to judge the change in the individual constituents of the index. For instance, there may be considerable improvements in the aggregate human poverty index while registering little progress in the nutritional status of under-five children which is but only one of the variables that enter HPI. *Second*, some dimensions of the well-being may not be reflected in the aggregate index because of their non-inclusion in the index itself (either because they are perceived as less important than the competing others, or simply because there is not adequate quantitative data on that particular indicator). Thus, some of the important social indicators of human poverty such as TFR and access to sanitation are not directly included in the HPI, though they clearly deserve separate attention.

Analysis of the aggregate measures, therefore, needs to supplement an approach that takes a more disaggregated look at the individual poverty and social indicators. In the following sections, we shall focus on those dimensions of well-being (or ill-being) which deserve separate analytical focus in their own right.

Spatial Trends in Social Indicators

Table 3 presents the disaggregated profile of other social indicators by administrative divisions and sectors. Evidence available at division level confirms considerable differentiation of human development across regions. Three aspects are noteworthy. *First*, there is some correspondence between the level of income and non-income poverty suggesting the role of private income in human development. As of mid-nineties, Rajshahi division had the highest incidence of income-poverty. Predictably, it had also the lowest level of adult literacy (35 vis-a-vis the peak point of 56 per cent in Barisal), life expectancy at birth (56.5 vis-a-vis 58.4 in Khulna) and child immunization rate (54.5 vis-a-vis 72.2 in Chittagong). Rajshahi also had the second highest level of infant mortality rate (79.9 vis-a-vis 72.4 in Khulna). *Second*, there is no one to one matching however. Chittagong division had the lowest income poverty (45% as against the peak point of 62 per cent in Rajshahi), but still displayed the second highest level of infant mortality, second lowest level of adult literacy, and the second lowest level of life expectancy. This suggests that the level of income alone cannot account for the entire variation in social progress. *Third*, there is also considerable diversity in the ranking of various social indicators implying a complex pattern of linkages between growth, income poverty and social indicators.

Table 4 brings out a few additional aspects. The regional variability appears considerably higher for some human development indicators than others. The variability, as captured by the coefficient of variation, appears to be higher for access to sanitation and child malnutrition compared with child mortality and net enrollment at the primary level. A very high degree of variability is observed with respect to arsenic contamination of the drinking water. This suggests that there is a greater need for developing a spatial focus in designing policies when it comes to tackling the issues of public health (with focus on primary health and nutrition) and poverty reduction.

Divisional picture, however, conceals deeper regional variations. Thus, a significant differentiation in poverty may be observed even within the Rajshahi division[4]. This explains why in the remaining sections of the paper we primarily look at the district level performance for various poverty and social indicators. However, it should be explicitly noted that even district based poverty mapping is *not adequate* to locate the most vulnerable pockets. One needs to go beyond division or district to identify the pockets of severe distress, i.e., areas which are more vulnerable to widespread starvation and intensified destitution during bad agricultural year and/or during the routine lean period even during a normal agricultural year. This is especially true in case of Bangladesh characterised by the highest population density (excluding the city-states) in the world, implying that even the small thana or union in the pockets of severe distress can affect a large number of population.

Trends in Spatial Inequality

The extent of spatial inequality measured at the divisional as well as district level shows modest improvement over the recent years. Two measures of inequality are used here. One relates to the coefficient of variation capturing the degree of spatial variability here. The other relates to the polarisation index comparing the rich-poor ratio over time. Both the measures show improvement. Thus, the spatial variability of HPI estimated at the district level has decreased from 13.16 to 11.98 between 1995 and 2000 (Table 2). The similar progress has been noted in respect of social indicators measured at the divisional level (Table 4) and at the district level.

III. Factors Influencing Social Progress

Earlier we have noted that a considerable variation exists for both poverty and other social indicators across districts. This section attempts to determine the factors that are responsible for the observed variation. This requires establishing an analytical link between human poverty (other social indicators as well) and economic development.[5]

Bi-variate Regression with District Level Data for 2000

[4] Variations in male labour wage across districts for both 1995 and 2000 are depicted in Maps 2 and 3 respectively. The maps indicate that while there are variations in wage rate in both 1995 and 2000, the situation with regard to changes in real wage has improved between these two periods. Some of the districts have been able to improve their situation from low to medium or medium to high wage categories.

[5] In this section, only the results carried out for the pooled 1995 and 2000 district level data have been presented. The important question of "determinants" of the pace of annual progress (with special attention to the role of "initial conditions") would be explored in the revised version of this paper.

Five sets of regression analyses have therefore been carried out in order to establish these links. The explanatory variable here is the per capita expenditure. The dependent variables represent the value of human poverty index, total fertility rate, under-five mortality rate, proportion of households having access to sanitary toilet and proportion of children (aged 12-59 months) under severe malnutrition (MUAC<12.5 cm) respectively. Both linear and log-linear specifications have been taken into consideration in this regard.

A bi-variate regression of all the poverty and social indicators with per capita expenditure, as presented in Table 5, reveals that the level of aggregate affluence matters (but not always) for social development. There is a significant inverse relationship at the district level between the incidence of human poverty and the level of per capita income (expenditure).[6] There is also a significant inverse relationship between under-five mortality and per capita expenditure. However, the matched relationships with "total fertility", "severe child malnutrition" and access to sanitation are not statistically significant. This suggests that growth matters for social development only in some respects, leaving considerable room for the non-growth factors as important factors of social progress.

Multivariate Regression with Pooled District Level Data for 1995 and 2000

Even in case of those social indicators where economic growth matters, it is often the *indirect* effects of growth (such as via income-poverty reduction and public spending on social and physical infrastructure) that eventually turn out to be the factors making the ultimate difference.[7] This may be tested in a multivariate framework, which represents a set of explanatory variables including the following: per capita expenditure, male wage rate (average daily), population per school, paved road as percentage of total (paved and unpaved) length of road, dummies for hilly (CHT) and flood-prone districts. In this model, 'wage rate' is considered as a proxy measure for the incidence of income-poverty[8], while 'population per school' and 'paved road as proportion of total road' capture the indirect growth effects percolating through the public expenditure channel. In this regression, the dependent variables represent the value of human poverty index, total fertility rate, under-five mortality rate, proportion of households having access to sanitary toilet, proportion of children (aged 12-59 months) under severe malnutrition (MUAC<12.5 cm) and secondary enrollment rate respectively. Both linear and log-linear specifications have also been taken into consideration. Several results of this statistical exercise are noteworthy (see, Table 6).

First, the independent effect of aggregate affluence (or, by implication, its growth expression) appears to be significant in two cases, observed with respect to the human poverty index and access to sanitary toilet. In respect of other chosen social indicators, it is the indirect effects of growth via the income-poverty reduction and public spending channels appear to be the more relevant immediate explanators of social progress. *Second*, the level of income-poverty appears to be a consistent important factor influencing social progress both when the aggregate measure such as HPI is taken into account and when specific aspects of social deprivations are considered. Districts, which have lower income poverty level, also tend to have lower human poverty index, reduced total fertility rate, lower child mortality,

[6] Per capita expenditure as estimated from HES data has been used as a proxy for per capita income of a district as no direct estimate of per capita GDP is currently available at the district level.
[7] See, Anand and Ravallion (1993) for the pioneering results on this score.
[8] A bi-variate linear regression using district level data for 1995 (district level income poverty data for 2000 is now available) with 'incidence of poverty' as dependent and 'male labour wage rate' as independent variable indicates a highly significant inverse relationship between the two (Table 11).

and higher access to sanitation. *Third*, various types of public expenditure impact differently on social development. Greater investments in schooling tend to reduce total fertility rate, decrease child mortality and increase access to sanitation and secondary enrollment, but appears uncorrelated with severe child malnutrition. Building all-weather paved roads must be considered an important social investment, acting as it is favourably on child mortality, access to sanitation, prevalence of severe child malnutrition and secondary enrollment (but, note, appears uncorrelated with total fertility rate). *Fourth*, even controlling for the possible differences attributable to growth, income-poverty, and public spending related indicators there appears strong region-specific effects, captured by the significant presence of the politically long-neglected Chittagong Hill Tracts (CHT) and ecologically vulnerable river-erosion districts. Being in CHT enhances the likelihood of facing greater incidence of "human poverty" (as measured by HPI) as well as high total fertility rate and under-five mortality rate. Similarly, being located in the river-erosion districts can magnify the incidence of overall HPI-poverty, though this factor is not a barrier to the attainment of other social goals.

Multivariate Regression with Male Wage Rate as the Dependent Variable with Pooled District Level Data for 1995 and 2000

As mentioned previously, 'male wage rate' has been considered hear as the proxy measure for the incidence of income poverty. An attempt has therefore been made here to analyze the variations of district level male wage rate by a set of explanatory variables in a multivariate framework (Table 7). Results show that the effect of aggregate affluence is significant in reducing the income poverty at the district level. Investment on infrastructure also contributes significantly in reducing income poverty at the district level. Controlling for variations attributable to growth and public spending, there appears region-specific effect of male labour wage. As it is observed, wages are higher in CHT while it is lower in the flood-prone districts.

Multivariate Regression with the Changes in Social Progress with District Level Data for the period 1991-2000

In the previous sub-sections, we have analyzed the factors that are responsible for social progress at the district levels in the country. In this section, an attempt has been made to analyze which initial condition variables have influenced faster social progress during 1995-2000 at the district level. This has also been done in a multivariate framework with the changes in social progress during 1995-2000[9] as the dependent variables and the initial conditions of these variables as well as initial growth performance at the district level as the explanatory variables (Table 8). Thus, the dependent variables here include the changes of human poverty, total fertility, under-five mortality, access to sanitary toilet, severe malnutrition and secondary enrollment between 1995 and 2000. The set of explanatory variables here include the initial (1991) condition variables of the rate of urbanization (considered here as a proxy measure for growth) and each of the dependent variables[10]. A double log specification has been used here to estimate the model.

[9] Changes here refer to the percentage changes and have been calculated by subtracting the value for 2000 from that of the value of 1995 for each of the variables. Hence, for HPI, TFR, U5MR and Severe Malnutrition, higher negative value of the difference refer to higher progress; and for sanitary toilet and secondary enrolment, higher positive value of the difference refer to higher progress.

[10] Exception here is literacy rate which has been considered here as the initial condition variables for three dependent variables - human poverty, severe malnutrition and secondary enrollment

Results show the following: First, the districts which had poor initial growth performance have been able to progress faster with regard to human poverty and secondary enrollment. Second, the districts, which had better initial condition of the same dependent variables, have been able to progress faster than the others. Both these evidence suggest the presence of 'social convergence' implying that poorer districts have made faster progress during the nineties.

IV. The "Instructive" Outliers and Deviants

The "determinants" of average social progress measured at the district level point to some important factors, having implications for growth and social policy. Districts of 'over' and 'under' achievers for various poverty and social indicators have been identified here by comparing the performance of the districts for each of the selected indicators to the predicted level of expenditure for 2000. Five indicators have been selected here in this regard. They are human poverty index, total fertility rate, under five mortality rate, access to sanitary latrine and prevalence of severe malnutrition. These indicators are considered to be the most important ones with regard to having influence on the overall poverty situation and social differentiation in the country[11].

Human Poverty Index (HPI)

With regard to the achievement in human poverty situation, the districts that have emerged as the districts of over achievers include Narail, Gopalganj, Jessore, Khulna, Barisal, Barguna, Jhalokathi and Pirojpur. Almost all of these districts belong to the south-western part of the country. On the other hand, the districts that have emerged as the districts of under-achievers belong to central-north, north-east and south-eastern (hill district) part of the country. They are: Jamalpur, Sherpur, Narshindi, Shunamganj, Sylhet and Rangamati (Table 9). Among these districts, Jamalpur, Sherpur and Rangamati have pockets of severe distress caused by either river erosion or presence of ethnic minorities. The results clearly show the relevance of adopting a more spatially disaggregated approach to human poverty reduction.

Total Fertility Rate (TFR)

The set of districts that have emerged as the districts of over-achievers for total fertility rate do not coincide with the previous set of the districts of over-achievers for human poverty except Narail. Other districts of the set include Gaibandha, Thakurgaon, Natore, Munshiganj and Gazipur. These districts belong to northern and central part of the country. Though the northern part of the country is known as relatively more poverty stricken region, some of the districts of this region have able to achieve more with regard to reducing the total fertility rate. It is therefore evident that TFR do not necessarily depend on the level of income of the region. On the other hand, two districts are found common in both the sets of under-achievers for HPI and TFR. They are Narshindi and Rangamati. Other districts of under achievers for TFR include Feni, Khagrachari and Chittagong all of which belong to the south-eastern part of the country (Table 9).

Under Five Mortality Rate (U5MR)

[11] Due to lack of availability of district level income poverty data, indicators of income poverty, which are also considered to be among the important ones, are not taken into consideration here.

Districts of over-achievers for U5MR belong to the central and northern part of the country. None of the districts of this set coincides with the previous two sets of over achievers. They are Tangail, Rajshahi and Manikganj. However, in the set of under achievers, some districts are found common to that of TFR. These include Feni and Chittagong both of which belong to the southern part of the country. Others include Patuakhali, Moulvibazar and Chandpur which belong to south and north-eastern part of the country (Table 9).

Access to Sanitary Toilet (AST)

Districts of "over" and "under" achievers for AST belong largely to the same regions of over- and under-achievers noted earlier for human poverty index with few exceptions. Districts of over-achievers in this case belong to the south-western part of the country except Lalmonirhat which belongs to northern part of the country. Districts of under-achievers belong to central-north and north-eastern part of the country except Bhola, Cox's Bazar and Narayanganj, which belong to central and southern part of the country (Table 9).

Prevalence of Severe Malnutrition (PSM)

Districts of over-achievers in this case belong largely to the central and northern part of the country except Satkhira which belong to the south-west. Districts of under-achievers belong to south-west, south and north-east. Surprisingly, Jhalokathi, which has emerged as the district of over-achiever for human poverty, has come out as under-achiever here in this case. There is however broad commonality of regions in terms of over-and under-achievers for PSM with that of TFR and U5MR with only a few exceptions. Exceptions include Satkhira for over-achievers and Jhalokathi and Bhola for under-achievers (Table 9).

V. "Deeper Interventions" for Overcoming Spatial Traps

The upshot of the preceding discussion is to point out that there are instructive deviants and outliers, which stand out from the rest. The North-Western (Rajshahi division) and South-Western (Khulna and part of Barisal) appear to have done better in terms of promoting social development than the North-Eastern (Sylhet division) and South-Eastern (Chittagong). The Central region (covering Dhaka division) has also fared well (Table 10). Two factors appear to be associated with the better performance of the over-achievers. *First*, construction of the Jamuna bridge (representing a massive public investment) helped to integrate the long-neglected Northern and South-Western regions with the rest of the country. This has contributed to the strengthening of the 'spread' effects emanating from the more advanced regions, especially in the Dhaka and Chittagong division.[12] *Second*, some districts in the greater Chittagong division which were historically backward showed considerable progress in terms of annual pace of change, though still lag behind others in terms of achieved attainment to date. These relate to regions in the Chittagong Hill Tracts, which seem to have benefited from the "peace process" unleashed during the period under consideration.

[12] Geographical proximity to West Bengal may also partly explain superior performance in the Rajshahi and Khulna division in terms of reducing total fertility rate (see, Amin and Basu 2001). Such "diffusion" effects, however, can provide only part of the explanations for fertility decline (see, Dev et al 2002). In any case, the strength of the diffusion effects may arguably have been increased following greater market integration signalled by the Jamuna bridge.

VI. Summary and Conclusion

Considerable regional and social variations in poverty exist in Bangladesh. Districts of over- and under-achievers for various poverty and social indicators do not necessarily coincide with each other. Some of the districts have achieved more compared to the others for some indicators while the others have achieved more for other indicators. It is also true in the cases of under-achievers. This implies that there is diversity in terms of achievement for various poverty and social indicators for each of the districts.

The results show that spatial inequality in social development, has been reduced by a modest extent over the second half of the nineties. This is measured by the spatial trends in respect of human poverty index and key social indicators such as total fertility rate, child mortality, severe child malnutrition, net enrollment rate at primary level, access to sanitation. The South-Western and North-Western districts which were historically lagging behind have done better during this period while the Nother-Eastern and South-Western districts could do more in accelerating the pace of social development compared to the predicted level implied by their level of average affluence. Market integration facilitated by the construction of the Jamuna bridge, the peace process in the Chittagong Hill Tracts, and, perhaps, fairly intense political competition for public allocations for social and physical infrastructures may have contributed to declining spatial inequality.[13]

There are however spatial pockets of severe social distress, which cannot be revealed by the district-level data. The results show the relevance of adopting a more spatially disaggregated, sub-district level approach to poverty reduction, having implications for decentralisation and local level planning.

[13] These factors need to be explored further through case studies and focus group discussions.

References

Anand, Sudhir and Amartya K. Sen (1996), *Concepts of Human Development and Poverty: A Multidimensional Perspective*, Background Paper for Human Development Report 1997, 1996 (Mimeo).

Anand, Sudhir and Ravallion, Martin (1993). "Human Development in Poor Countries: on the Role of Private Incomes and Public Services." *Journal of Economic Perspectives*. Vol. 7(1): 133-150.

BANBEIS. *Bangladesh Educational Statistics* (various years). Bangladesh Bureau of Educational Information and Statistics, Dhaka.

Bangladesh Demographic and Health Survey (various years).

BBS & NIPORT (1995). *Health and Demographic Survey (HDS) of Bangladesh*. Dhaka: BBS and NIPORT.

BBS. *Household Expenditure Survey* (various years), Bangladesh Bureau of Statistics, Dhaka.

BBS. *Statistical Pocket Book of Bangladesh* (various years), Bangladesh Bureau of Statistics, Dhaka.

BBS. *Statistical Yearbook of Bangladesh* (various years), Bangladesh Bureau of Statistics, Dhaka.

BIDS (2001). *Human Development Report of Bangladesh 2000*, Bangladesh Institute of Development Studies, Dhaka.

DPE. *Primary Education Statistics in Bangladesh* (various years), Department of Primary Education, Government of Bangladesh.

LGED. "Data on Roads by Districts", Local Government Engineering Department, Government of Bangladesh.

Ministry of Planning. *Fourth Five Year Plan*, Government of Bangladesh.

Osmani, S. R. and Bhargava, A. (1998). "Health and Nutrition in Emerging Asia", *Asian Development Review*, 16(1).

PRCPB (2003). "PRCPB Database", Programme for Research on Chronic Poverty in Bangladesh, Bangladesh Institute of Development Studies, Dhaka.

Sen, B. and Rahman, A. (2000). "Face of Human Poverty: South Asia Poverty Monitor 2000", Bangladesh Institute of development Studies, Dhaka.

Sen, Binayak and Ali, Zulfiqar (1999). "Poverty Reduction and Human Development in Bangladesh: Some Recent Evidence", background paper prepared for Bangladesh Human Development Report 2000.

Sen, Binayak and Sharifa Begum (1998). "Methodology for Identifying the Poorest at Local Level." *Technical Paper No.27*. WHO, Geneva.

UNDP. *Human Development Report* (various years).

UNICEF. *"Asha"* and *"Kamona"*, (various years).

UNICEF. *Progotir Pathey* (various years).

Table 1
Trends in Human Poverty Index, 1981-2000

Variables	1981-83	1993-94	1995-96	1997-98	2000
Deprivation in Longevity (P_1)	28.0	20.0	18.0	14.3	13.6
- Probability of dying before age 40	28.0 (1983)	20.0 (1993)	18.0 (1996)	14.3 (1997)	13.3 (2000)
Deprivation in Knowledge (P_2)	62.6	46.4	42.7	38.7	35.4
- Adult illiteracy (weight: 2/3)	70.8 (1981)	58.0 (1994)	54.4 (1996)	49.0 (1997)	44.0 (2000)
- Child aged 6-10 years not attending school (weight: 1/3)	46.3 (1982/83)	23.1 (1995/96)	18.9 (1996)	18 (1997)	18.0 (2000)
Deprivation in Economic Provisioning (P_3)	75.1	59.3	51.4	50.2	44.4
Public Provisioning	78.7	54.4	45.4	44.1	41.2
Share of population without access to health services proxied by a composite indicator of:	97.8	65.8	56.9	57.3	50.9
- children not fully immunised	98.0 (1981/82)	41.1 (1993)	23.7 (1995)	32.5 (1998)	25.6 (2000)
- % of deliveries not in the institutions	97.6 (1983)	90.5 (1993)	90.1 (1995)	82.1 (1998)	76.3 (2000)
Percentage of population with out access to safe (tubewell) water	43.3 (1981)	20.0 (1991)	7.0 (1995)	5.0 (1998/99)	2.5 (2000)
Percentage of population not living in electrified houses	95.0 (1981)	77.3 (1994)	72.4 (1995)	70.0 (1998/99)	70.0 (1998/99)
Private Provisioning					
- Percentage of children under 5 years of age who were malnourished	71.5 (1985)	64.2 (1995)	57.4 (1996)	56.3 (1996/97)	47.7 (1999/00)
Human Poverty Index	**61.3**	**47.2**	**41.8**	**39.7**	**35.5**

Notes:
- HPI Index is calculated as follows:
  $HPI = [\ 1/3\ (\ P_1^3 + P_2^3 + P_3^3\ )]^{1/3}$
- Probability of dying before age 40 was derived as follows:
  IMR in 1993 was 84 when probability of dying before age 40 was 20. Using this ratio and given IMR for 1996 as 67, we get probability of dying before age 40 for 1996 = 16.0
- Child aged 6-10 years not attending school is considered only.
- Deliveries not by trained workers are considered

Note: (a) 1981-83 and 1993-94 estimates are taken from South Asia Poverty Monitor Report 1999/00 (SAPM) by Sen and Rahman (2000). (b) 1995/97 figures are taken from the following sources. The estimate of "Probability of dying before 40" is based on Statistical Pocket Book 1997 of BBS, p. 151. Adult literacy figure is taken from FFYP. Data on non-enrolment, immunization, non-institutional delivery, and access to safe water figure are taken from Progotir Pathay (various issues) published y UNICEF. Information on access to electricity is from HDS of BBS, while that for child malnutrition is from BDHS 1996/97. (c) 1997/98 figures are taken from the following sources. The estimate of Probability of dying before 40", adult literacy and non-enrolment figures are based on Statistical Pocket Book 1999 of BBS. Data on immunization is taken from Progotir Pathay 1998. Information on child malnutrition is from BDHS 1999/00. (d) 2000 figures are taken from the following sources. The estimate of Probability of dying before 40", adult literacy and non-enrolment figures are based on Statistical Pocket Book 2000 of BBS. Data on immunization, deliveries not in the institutions and access to safe water are taken from Progotir Pathay 2000. Information on child malnutrition is from BDHS 1999/00.

Source: BIDS (2001) and PRCPB Data Base.

Table 2: Value of Human Poverty Index (HPI) by District

District Name	HPI 1995	HPI 2000	Average Annual % Change in HPI During 1995-2000
Bandarban	51.6	39.77	-4.59
Rangamati	46.24	35.74	-4.54
Jhalokati	31.54	25.4	-3.89
Jamalpur	51.06	41.87	-3.6
Nilphamari	46.86	38.5	-3.57
Tangail	39.33	32.48	-3.48
Pirojpur	31.16	25.82	-3.42
Comilla	31.88	26.72	-3.24
Barguna	33.79	28.43	-3.17
Patuakhali	35.76	30.56	-2.91
Khagrachhari	43.86	37.58	-2.87
Khulna	32.51	27.95	-2.81
Mymensingh	40.3	34.7	-2.78
Moulvibazar	37.77	32.69	-2.69
Bogra	37.72	32.75	-2.64
Rajbari	43.75	38.03	-2.61
Shariatpur	42.28	36.76	-2.61
Naogaon	36.91	32.32	-2.48
Lalmonirhat	40.67	35.63	-2.48
Gaibandha	39.95	35.08	-2.44
Thakurgaon	40.32	35.87	-2.21
Satkhira	35.53	31.74	-2.13
Chandpur	33.28	29.76	-2.11
Pabna	40.36	36.11	-2.11
Sylhet	39.11	35.08	-2.06
Madaripur	38.59	34.64	-2.05
Narayanganj	31.58	28.45	-1.98
Kishoreganj	39.35	35.59	-1.91
Chittagong	32.29	29.21	-1.91
Panchagarh	38.71	35.03	-1.9
Jhenaidaha	35.74	32.37	-1.89
Magura	36.34	33.04	-1.81
Noakhali	36.33	33.05	-1.8
Manikganj	38.93	35.44	-1.79

District Name	HPI 1995	HPI 2000	Average Annual % Change in HPI During 1995-2000
Sirajganj	42.59	38.83	-1.77
Bagerhat	32.58	29.72	-1.76
Barisal	31.8	29.03	-1.74
Feni	30.83	28.15	-1.74
Kurigram	43.14	39.42	-1.73
Gopalganj	32.51	29.77	-1.69
Jessore	30.77	28.2	-1.67
Sunamganj	43.01	39.44	-1.66
Rangpur	41.7	38.26	-1.65
Dinajpur	36.24	33.31	-1.62
Habiganj	37.23	34.45	-1.49
Narsinghdi	37.93	35.25	-1.42
Gazipur	34.93	32.49	-1.4
Lakshmipur	34.8	32.39	-1.39
Rajshahi	35.98	33.57	-1.34
Chuadanga	34.02	32.11	-1.12
Netrokona	39.04	37.06	-1.01
Nwabganj	41.68	39.66	-0.97
Sherpur	45.15	42.98	-0.96
Natore	36.02	34.42	-0.89
Joypurhat	37.23	35.7	-0.82
Brahmanbaria	39.26	37.65	-0.82
Narail	32.41	31.26	-0.71
Bhola	37.48	36.32	-0.62
Kushtia	36.79	35.78	-0.55
Meherpur	36.91	36.01	-0.49
Munshiganj	29.68	29.07	-0.41
Faridpur	35.26	34.59	-0.38
Dhaka	26.87	26.51	-0.27
Cox's Bazar	38.68	38.44	-0.13
National	**41.8**	**35.5**	**-3.01**
Coefficient of Variation	**13.16**	**11.98**	**-**

Table 3
Human Development Profile at Disaggregated Level in Bangladesh

Area	Adult Literacy Rate	IMR (per 1000 live births)	Life Expectancy at Birth	Immunization (12-23 months)	Child Death Rate 1-4 Years	Head-Count Index of Poverty
	1995	1995	1995	1995	1995	1995/96
Division:						
Barisal	56.4	76.6	57.2	64.6	10.8	59.9
Chittagong	41.2	81.9	57.0	72.2	8.9	44.9
Dhaka	43.0	78.3	58.3	52.7	10.8	52.0
Khulna	47.2	72.4	58.4	81.3	9.5	51.7
Rajshahi	35.2	79.9	56.5	54.5	8.6	62.2
Sector:						
Rural	36.6	83.3	57.1	61.3	10.2	56.7
Urban	60.0	60.8	60.6	76.3	7.7	35.0
National	42.6	77.7	57.9	65.4	9.7	53.1

Source: BIDS (2001).

Table 4
Human Development Profile at Disaggregate Level in Bangladesh, 2000
(By Divisions and Sectors)

Area	Under 5 Mortality		Rate of Immunization (DPT) (12-23 months)		Malnutrition (12-59 months)		Net Enrolment (6-10 years)		Access to Safe Drinking Water		Arsenic Contamination in Drinking Water Reported		Access to Sanitary Latrine	
	1995	2000	1995	2000	1995	2000	1995	2000	1995	2000	1995	2000	1995	2000
Division:														
Barisal	106	92	80.5	71.2	9.1	7.75	86.65	84.95	93.2	95.4	-	0.2	51.7	50.1
Chittagong	149	92	66.5	78.7	8.95	4.60	84.3	81	93.79	96.3	-	5.1	41.1	41.9
Dhaka	137	91	69.3	71.7	10.0	4.35	76.85	79.35	99.8	99.6	-	3.1	35.0	38.0
Khulna	108	91	92.1	82.3	4.05	4.25	87.65	87.2	91.3	91.4	-	5.3	41.8	63.2
Rajshahi	129	94	84.1	74.2	6.8	4.20	77.4	82.6	99.2	99.9	-	2.4	27.0	39.6
Sylhet	-	93	-	64.9	-	4.50	-	79.25	-	95.0	-	0.0	-	47.0
Coefficient of Variation (Dist. Level Data)	27.44	5.78	21.90	16.83	60.87	47.37	10.60	7.13	18.09	9.07	-	220.89	40.57	41.93
Sector:														
Rural	-	-	76.0	73.5	8.15	4.75	80.85	81.85	96.7	97.3	-	3.4	36.4	41.3
Urban	-	-	80.0	82.7	6.15	3.95	86.0	80.75	99.3	99.5	-	1.1	79.1	61.2
National	125	92	76.4	74.4	7.75	4.65	81.4	81.75	96.9	96.7	-	3.1	40.7	43.4

Source: PRCPB Database.

Table 5: Summary Table of Bi-variate Regression for Selected Poverty and Social Indicators for 2000

Explanatory Variable	Types of Model	Dependent Variables				
		HPI	TFR	U5MR	Sanitary Toilet	Severe Malnutrition
Per capita expenditure	Linear	-.29**	-.14	-.26**	.16	-.17
	t-ratio	-2.38	-1.08	-2.09	1.25	-1.35
	Adj. R^2	.07	.003	.05	.01	.01
	F-ratio	5.67	1.16	4.35	1.57	1.81
	N	63	63	63	63	63
Per capita expenditure	Log-Linear	-.30**	-.13	-.27**	.17	-.17
	t-ratio	-2.50	-.99	-2.17	1.32	-1.31
	Adj. R^2	.08	.00	.06	.01	.01
	F-ratio	6.23	.97	4.69	1.73	1.71
	N	63	63	63	63	63

** Significant at 5% level.

Table 6: Summary of the Results Obtained Based on both Linear and Log-linear (double log) Pooled Regression with District Level Data for 1995 & 2000

Explanatory Variables	Dependent Variables											
	HPI		TFR		U5MR		Sanitary Toilet		Severe Malnutrition		Secondary Enrollment	
	Lin	Log	Lin	Log	Lin	Log	Lin	Log	Lin	Log	Lin	Log
Average per capita expenditure	-.40**	-.41**	-.20*	-.13	-.16	-.10	.28**	.23**	-.06	-.06	.10	.01
Male labour wage	-.22**	-.20**	-.24**	-.30**	-.15	-.23**	.25**	.26**	-.10	.03	-.19	-.17
Population per school	.12	.15*	.23**	.30**	.15	.20**	-.24**	-.21**	-.03	-.12	-.27**	-.32**
Paved road as % of total road	-.15**	-.20**	-.32**	-.40**	-.34**	-.44**	.34**	.40**	-.28**	-.32**	.12	.17**
Dummy for CHT	.48**	.45**	.31**	.34**	.26**	.25**	-.08	-.12	-.14	-.21**	-.07	-.11
Dummy for flood-prone districts	.21**	.18**	-.08	-.09	-.03	-.03	-.08	-.12	.09	.10	.04	.03
Adjusted R^2	.47	.48	.26	.32	.21	.30	.34	.37	.13	.14	.04	.06
F-ratio	19.91	20.12	8.33	11.06	6.52	9.97	11.81	13.34	4.19	4.33	1.87	2.41
N	127	127	127	127	127	127	127	127	127	127	126	126

** Significant at 5% level. * Significant at 10% level.

Table 7: Results Obtained Based on both Linear and Log-linear (double log) Pooled Regression with Male Wage Rate as the Dependent Variable with District Level Data for 1995 & 2000

Dependent Variables	Model Specification	Explanatory Variables					Adjusted R^2	F-Ratio	N
		Average per capita expenditure	Population per school	Paved road as % of total road	Dummy for CHT	Dummy for flood-prone districts			
Male Wage Rate	Linear	.52**	-.04	.31**	.15**	-.14**	.50	26.44	127
	Log-linear	.55**	-.02	.26**	.15**	-.15**	.50	26.64	127

** Significant at 5% level.

Table 8: Summary of the Results Obtained Based on Log-Linear (double log) Change Regression with District Level Data for 1991-2000

Explanatory Variables (1991)	Dependent Variables (Change between 1995 & 2000: 2000-1995)					
	HPI	TFR	U5MR	Sanitary Toilet	Severe Malnutrition	Secondary Enrollment
Rate of urbanization	.26**	-.03	-.06	-.14	.20	-.23*
Literacy rate	-.32**	-	-	-	.01	-.15
Total fertility rate	-	-.31**	-.21	-	-	-
Infant mortality rate	-	-	-.31**	-	-	-
Access to sanitary toilet	-	-	-	.01	-	-
Dummy for CHT	-.60**	-.14	-.35**	.27*	-.02	.22*
Dummy for flood-prone districts	-.20*	-.18	-.05	.07	-.07	.01
Adjusted R^2	.29	.11	.27	.01	.00	.06
F-ratio	7.48	2.94	5.72	1.06	.73	1.95
N	64	64	64	64	64	63

** Significant at 5% level. * Significant at 10% level.

Table 9: Districts of Over and Under Achievers for Various Social and Poverty Indicators Compared to the Predicted Level of Income/Expenditure, 2000

Indicators	Over Achievers	Under Achievers
Human Poverty Index (HPI)	Narail Gopalganj Jessore Khulna Barisal Barguna Jhalokathi Pirojpur	Jamalpur Sunamganj Sherpur Sylhet Narshindi Rangamati
Total Fertility Rate (TFR)	Narail Gaibandha Thakurgaon Natore Munshiganj Gazipur	Feni Khagrachari Chittagong Narshindi Rangamati
Under Five Mortality Rate (U5MR)	Tangail Rajshahi Manikganj	Patuakhali Feni Chittagong Moulvibazar Chandpur
Access to Sanitary Toilet	Narail Kushtia Magura Lalmonirhat Meherpur Satkhira Pirojpur	Netrokona Jamalpur Sunamganj Sherpur Bhola Cox's Bazar Narayanganj
Prevalence of Severe Malnutrition	Tangail Joypurhat Pabna Lalmonirhat Manikganj Munshiganj Satkhira	Sunamganj Noakhali Jhalokathi Bhola

Table 10: Regions of Over and Under Achievers for Various Social and Poverty Indicators Compared to the Predicted Level of Income/Expenditure, 2000

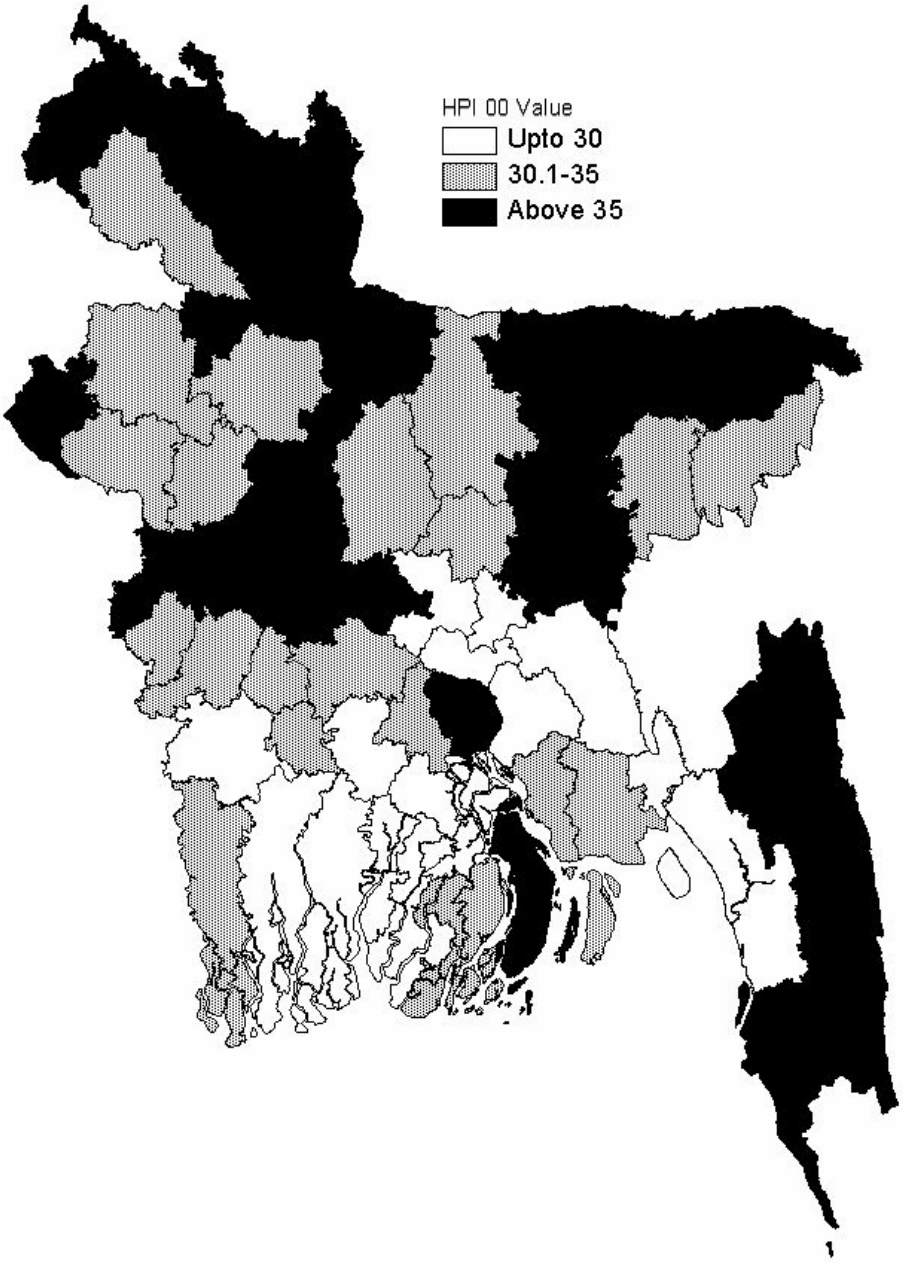
Indicators	**Over Achievers**	**Under Achievers**
Human Poverty Index (HPI)	South-West	Central-North North-East South-East
Total Fertility Rate (TFR)	North Central South-West	South-East
Under Five Mortality Rate (U5MR)	North Central	South South-East North-East
Access to Sanitary Toilet	South-West North	Central-North North-East South South-East
Prevalence of Severe Malnutrition	Central North South-West	North-East South (Exception: Jhalokathi)

Table 11: Exploring the Relationship between the Incidence of Poverty and Wage Rate: A Bi-variate Linear Regression Using District Level Data for 1995

Dependent Variable	**Explanatory Variable (Male Wage Rate)**	**Adjusted R^2**	**F-Ratio**	**N**
Head-count Index	-.63***	.39	41.31	64

*** Significant at less than 1% level.

Map 1: Variation in Regional Human Poverty in Bangladesh (2000)



District

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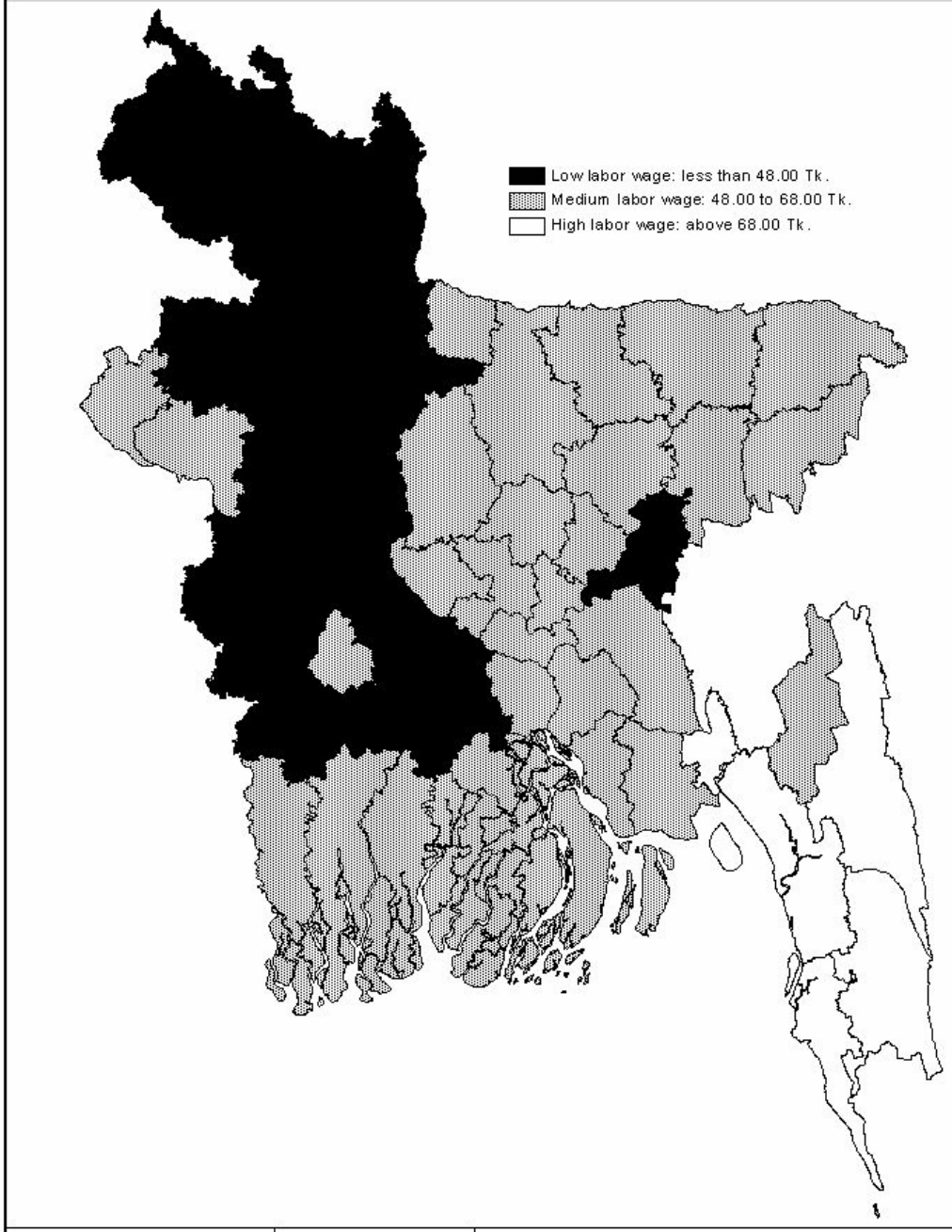
Map 2: Labor wage distribution in Bangladesh (1995)*



* Wage rate in 1999 prices to make map 1 and 2 comparable

Map 3: Labor wage distribution in Bangladesh (1999)