Developing a need based resource allocation formula using inverse probability weighting methods in poor data settings: lessons from Bangladesh

by

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1.1. Introduction

The allocation of public funds for the health sector in Bangladesh, like in many developing countries, is based on a historic budget and the location of the health facilities which are not established according to the need or demand. As a consequence of this, inequitable distribution of health care inputs among regions exists, and allocations are found to be inconsistent with health policy goals. In Bangladesh, allocation of funds for health care are mostly centrally planned and managed. Apart from of Ministry of Health, Ministry of Finance plays key role in allocation and disbursement of public funds, donor funds, grants and loans. The Ministry of Establishment plays a significant role in determining the distribution of health care professionals. A need based allocation method, applied in many developed countries and in some developing countries, could help to better match resources to need for health care. Such a mechanism could help to increase the impact of the various health reforms being introduced in the country with view to improve the health care and health status of the population.

Health services in Bangladesh are provided by public sector facilities and providers under the Ministry of Health and Family Welfare (MOHFW), growing private sectors, and Non-

Governmental Organisations (NGO). The National Health Account estimates for Bangladesh in 1996-97, about 34 percent of health financing came from public sources, 64 percent from private, out-of-pocket household expenditures, and 1 percent from NGOs (Data International, 1998). The MOHFW is the largest provider of health care services, it uses its facilities that operates nationwide. There are six divisions in the country; each division has a number of districts. There are in total 64 districts in the country, and each has a district hospital. The district hospital serves a population of between one and two million people, and their size varies between 50 and 250 beds. The districts hospitals provide curative health care, child health care, and reproductive health services. Each district has a number of sub-districts, and altogether there are 460 sub-districts in the country and almost all sub-districts have a 30-50 beds health facility. The sophistication of health care increases with the increase in the level of hierarchy. Such facilities provide, at the one end the domiciliary services at the household level, and on the other hand the tertiary level of care at the Division/District level hospital and specialized hospitals. The public sector facilities and providers serve largely the poor and middle income households in the country and services are generally free, although major hospitals offer special beds and cabins, for which fees must be paid. Besides there has been a very nominal 'fee' for outpatient contact and inpatient admission fee at the district level hospitals. The allocations of funds for the districts are mainly to these facilities and financially controlled by the district administrative authorities.

There has not been enough research conducted in Bangladesh to evaluate the equity of allocation of health care resources out of the government fund to the different regions of the country. Ensor *et al* (Ensor et al 2001) have studied the geographic allocation of resources in the health sector of Bangladesh. They used a weighted need based resources allocation formulae similar to the one developed by Resource Allocation Working Party (RAWP) in England (DHSS 1988) and estimated a need based allocation of the total expenditure on all health care services and institutions (irrespective of whether they are providing health care services or not) that belong to the Ministry of Health and Family Welfare. However, this study did not use an econometric model using both demand and supply equation systems. It is also important to determine the factors that are suitable for using to adjust for need that would enable to strengthen the argument for any recommended policy changes for an equitable need based allocation.

This research aims at the development of need based allocation for the total allocation of government's health care expenditure across districts of the country. Such need based allocation will enable the policy makers to examine the extent of difference between desired level of normatively determined equitable distribution and existing level of allocation or expenditure across districts or regions in Bangladesh.

Section 1.2 provides theoretical background and estimation procedure used for the models used to determine the needs based allocation. Section 1.3 provides the results and section 1.4 presents the discussions and conclusion from the research.

1.2 Methodology

The idea of suggesting a principle for resource allocation for this study is be based on the one of the seven possible interpretation of equity suggested by Mooney (1982), viz., – " equal access for those with equal need." The application of this principle in practice requires the development of a measure of need for health care and then developing a model that would explain the relationship between the health states and the measure of need on the one hand provision of care on the other. This principle of resource allocation used by RAWP in England to allocate health care resources among regions forms the theoretical basis to start with a capitation formula, where equitable or equity is defined as the distribution of health care according to need of the population of the regions, and need is equated with ill-health so that people with the similar status of health will have same need for health care and people with different health status will have different need.

Model for Demand for Health Care and supply of health

In order to substantiate the arguments for using such weighted capitation formula that may have policy relevance, it is important to examine how this formulation can be supported with sound evidence from available relevant data, robust economic arguments and econometric methodology. Most of the capitation based funding formulae are developed on the basis of relationship of need for health care health status and other factors that explain the need, and factors that explains the provision of health care needs. As a first step in doing so, most of these formulations examined the process how the demand for health care forms important components of the model which explains the relationships and captures the important

features. The demand for health care has been represented by utilisation of health care that represents the health care needs, as "needs" can be said to refer to illness and the main factor affecting utilisation. The measure of the level of need across regions of interest in the research can be either based on health care provider's report or diagnosis, or can based on reported illness in household level survey. Utilisation relates to the use of health care services. In order to analyse the utilisation, it needs to be determined the underlying socio-economic, demographic characteristics of the population of the region, and health characteristics of the population. The availability of health services and facility in the regions will also affect the expectation of the services available and hence demand for health care. In such capitation formula, it is assumed that level of utilisation, $U_{i,}$ represent the demand for health care, and utilisation in region., e.g. region *i*, is a function of health care needs N_i, availability of services *F* in within the region *i*, and socio-economic and demographic characteristics of the district X_i.

$$U_i = f(N_i, F_i, X_i) \qquad (1a)$$

Health care needs (N_i) are to be determined by socio-economic and demographic conditions, and hence it can be noted that

$$N_i = f'(Xi) \qquad (2a)$$

The next important fact is to note that supply of health care service in a region is also function of utilisation and need and this can expressed as

$$S_i = f(U_i, N_i, X_i) \qquad (3a)$$

So supply and utilization are jointly determined and the variables are endogenous. It is useful to determine which supply variables can be noted as endogenous. The factors that can influence the supply of service are assumed to be the number of beds in the districts, and availability health human resources.

A simplified form of the model is driven by the availability of data. Estimation of the model need to be sound and robust, and hence a simple ordinary least square method of estimation of the equation *1a* is not accepted as this is expected to provide biased estimates of the regression co-efficient. It is necessary to test the endogeneity, and its existence would require

application of improved method of estimation, for example use of two-stage least square.

Size of population has been an important need adjustment factor as the population in regions are weighted according to the age, sex and gender distribution to capture the differences in use of health care resources in these groups and cater to their need (DHSS 1976, DHSS 1988, Car-Hill *et al* 1994, Townsend and Davidson 1982). Rice and Smith (1999) in their review of capitation schemes in 19 countries[1] found that except two schemes, all the rest has used such adjustment factor. The other formulae that have used the age sex-adjustment for the use of different health services include the allocation formulae in Ontario (Bedrad et al 2000), New South Wales, (Hindle, D. 2002), the SAHARA, the South African Resource Allocation (McIntyre *et al* 1991). The SAHARA used age sex adjustment of hospitalization rates and age sex adjustment of potential life years lost to allocate resources used for curative and preventive care. Studies also suggest that age-sex adjustment weights need further adjustments for areas and population having age distribution significantly different from nation average level of age distribution. For example additional adjustment was made for aboriginal population in New South Wales and Alberta (Mayston 1998, Rice and Smith 1999). The health status of the population has been considered to be another important factor or a direct measure of need and has been used as risk adjustment for almost all resource allocation formulae. The best choice to measure health statuses are information on morbidity conditions in different age and gender groups. Morbidity information for the population is normally collected from general household survey, census, or from reports on utilisation from health facilities and medical practitioners. Self reported illness from households survey may not always give the true picture as there may be under-reporting of illness conditions in population whose 'perceived illnesses may be lower than that would be determined through medical records/examination' (Cleary and Jatte 1984, Hayes *et al* 1990). On the other hand clinical records ignore morbidities that does not come to the attention of health systems and often fail to cover chronic conditions that exist in the households (LeGrand 1978, McDowell and Newell 1987, Cleary and Jatte 1984). Developed and improved records and information on chronic conditions (permanent sickness or disability) mitigate such problem in developed countries. Different funding formulae in England (Carr-Hill *et al* 1994, Rice *et al* 2000) have included the chronic conditions. Measures of mortality as a proxy measure of morbidity have been considered in allocation formulae. Major problems of using purely mortality

[1] Australia, Belgium, Canada, Finland, England, France, Germany, Israel. Italy, Netherlands, New Zealand, Northern Ireland, Norway, Scotland, Spain, Sweden, Switzerland, USA, and Wales

information are related to the fact that there exists low correlation between mortality and non-serious illness. Mortality may not reflect serious disability in some conditions and such relationship may vary across socio-economic groups, causes of sickness and deaths, and age groups (Eyles and Birch 1993). Hence the rates of mortality are adjusted for age and sex for the population to form the Standardized Mortality Ratio (SMR). SMR has been found to be a good indicator of need for health care has long been established as an important measure in explaining the variations in health care resources use in UK (Carr-Hill *et al* 1994). Besides significant correlations between SMR and morbidity associated with considerable and continuing needs for health has been found (Forster 1997, Palmer 1978, Mays and Bevan, 1987).

There is a relationship between socio-economic status, deprivation and need for health care. Literature suggests that people with lower income, with lower level of education, with deprived living conditions, experiences significantly poorer health status than people in higher income group, educated and living in better living conditions. Studies have suggested a strong link between deprivation and mortality in England and Wales (Townsen *et al* 1988, Carstairs and Morris 1989), in Scotland (Carstairs and Morris 1989, Mcloone and Boody 1994, Mc Caroon *et al* 1994), the Netherlands (Kunst *et al 1990)*, and Spain (Benach and Yasui 1999). Different measures of deprivation were found to be used is the UK.

Attempts to develop a need based formula for a low a middle income country like Bangladesh, would require a careful consideration on how far the above mentioned major measures of need and adjustment factors can be used in data-poor environment.

However, considering the data requirement for this model and applying it for this study, it is observed data at the district level of utilisation of health facilities, e.g. districts hospital are incomplete and often not reliable. Besides, the supply side data to measure the supply of health requires information on number of hospital episodes, size of hospitals, access to public sector physicians and other providers in all the districts, and the number of contacts with these providers. Complete and reliable information for these are not available. There are also other contextual factors that influence supply of health services that are such model. Information on age, sex distribution of the population in the districts are available for Bangladesh, but when it comes to type of detail mentioned and are used in many developed country context, the data are limited. Limited data on socio-economic information are

available to adjust the need for the model.

Steps in analysis

First we built up a model for the supply side, which is represented by the average actual allocation and estimate the supply function. This model examines the factors that determine the current allocation. The explanatory variable included the demographic characteristics (population, mortality rate) of the population in the districts, socio-economic characteristics (deprivation and poverty status), size of the districts (area), and health care facility (number of beds, number of doctors and nurses employed by the public sector). The estimated supply function is:

$Ai = f(Di, Fi, Xi)$, where

Ai = actual allocation for district, *Di* = demographic and socio-economic characteristics, *Fi*- health facility and providers, and *Xi*= is the size of the districts, *i*= 1……64.

The second step involved estimation of the demand (need) for health care/services to examine the determinants of the health care needs, i.e. estimate the demand (needs) function. The explanatory variable included are demographic characteristics (age, sex, and marital status) of the individual surveyed, socio-economic characteristics (household food expenditure as proxy of household income), location of households – urban or rural, households construction material, household have electricity or not, the district characteristics (size of the district – area, population, health care facility – number of beds, number of doctors and nurses). The
The estimated demand function is:

$Ni = f(Di, Fi, Xi)$, where

Ni = reported illness, (acute, chronic or any illness), *Di* = demographic and socio-economic characteristics, *Fi*- health facility and providers, and *Xi*= district characteristics, , *i*= 1……64.

The next step involved generating district level weights using inverse probability weights (Robins *et al* 1995, Wooldridge 2000) using the estimated demand function based on representative sample of individuals surveyed in each districts. The predicted value of need

estimation for each districts were estimated as predicted = [E(sample)* β^], and weights *Wi* = (1/predicted probability)*i*. The current allocations are then weighted by the needs weights, to give the counterfactual allocation.

We then examined the differences between the current and the adjusted level of allocation – expecting that some districts will receive more allocation based on needs, while others less, or may get more or less same amount.

Data Source

The data on population, age and gender distribution are taken from population census for the year 1991 and 2001 available from the Bangladesh Bureau of Statistics (Bangladesh Bureau of Statistics 2002). The information on mortality for the districts is taken from the population census report of the year 2001. The death rate for different age and gender group for each district are obtained from the population census report and the Directorate of Health Services of the Ministry of Health and Family Welfare. The health expenditure data for different age groups at the public sector health facilities were taken from the estimates available from the survey conducted for the study on National Health Accounts in 1999 (**Error! Reference source not found.**). Data on IMR are taken from the survey on Bangladesh Maternal Health Services and Maternal Mortality Survey 2001 (NIPORT. 2003). Information on health expenditure in different regions districts are obtained from the database developed by the Financial Management Accounting Unit (FMAU) of the Ministry of Health Family Welfare. For this study, two years average data (2005 and 2006) were used for the analysis, and is considered as average base level allocation.

Information on reported illness (acute, chronic or any illness) for the demand (need) estimation are obtained from the Household Income and Expenditure Survey, 2004,

conducted by Bangladesh Bureau of Statistics(BBS) 2004. The survey collected information at individual level (above 48,000 individual from about 10,080 households. The data set also provide information on household characteristics (household expenditure on food, construction type of the households, whether have electricity or not , whether the household is located in urban or rural area). Information on health facility in the districts, i.e. number of hospital beds, health hum resources (number of doctors and nurse in the districts) were obtained from Ministry of Health and Family Welfare.

Information on deprivation and poverty used for the supply (allocation) estimation were based on Human Poverty Index (HPI) used by UNDP is based on three basic dimensions of human development - 2005: a) *long and healthy life* - measured by the probability at birth of not surviving to age 40, b) *knowledge* - measured by the adult literacy rate, c) *decent standard of living* - to determine the lack of access to overall economic provisions, measured by the un-weighted average of two indicators, the percentage of population without sustainable access to improved water source and the percentage of children under weight for age. The data on Human Poverty Index (HPI), that are available for each districts are obtained from the Bangladesh Institute of Development Studies (BIDS, 2003).

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1.3 Results

The supply equation estimates suggest that level actual health resource allocation (lalloc) across districts are determined by the number of beds (beds1) and health human resource (humr_1) employed in the districts. The human poverty index, mortality rates, size of the population (pop2) does not determine the level of allocation. This suggests that the level of current allocations is more based on historical budget and the need factors are not taken into account (Table 1).

Table 1: Determinants of allocation

	(1)
VARIABLES	lalloc
Morrate (moratlity rate)	0.000291
	(0.0139)
pop2 (population in districts)	0.143*
	(0.0726)
area1 (size/area of districts in square kilometres)	-0.0171
	(0.0496)
beds1 (number of beds)	0.0604***
	(0.0171)
hpi_q1 (human poverty index)	-0.106
	(0.128)
humr_1 (number of health human resource – doctors and nurses working in the districts)	0.317**
	(0.132)
Constant	4.438***
	(0.177)
Observations	64
R-squared	0.710

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

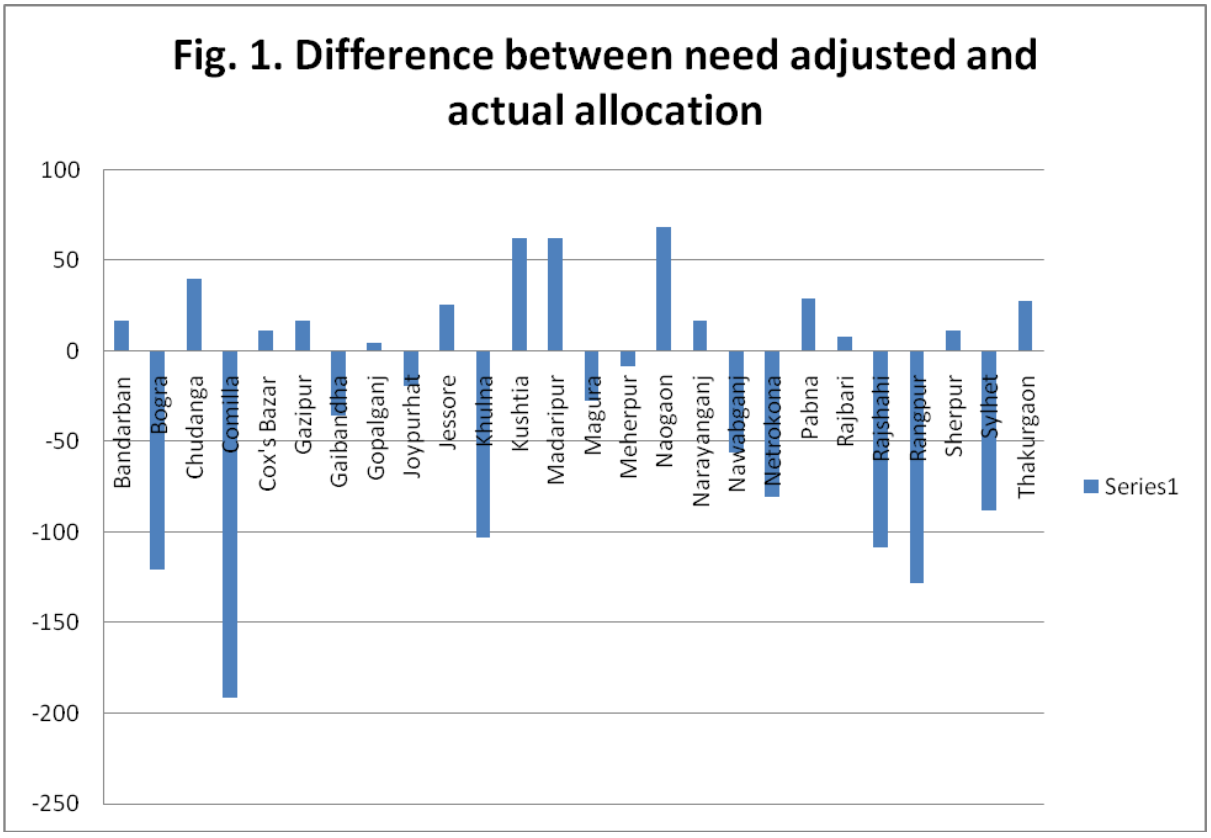
We estimated probit models, considering the two major types of reported illness. These two types were acute illness or chronic illness. Another probit model was estimated to examine the determinants of probability of being in any illness (acute or chronic). Age was found to explain the probability of chronically ill or any illness as expected. We did not find gender being a significant determinant for reported to have suffered acute illness, or chronically ill. The household food expenditure, used as proxy of income, has a negative relation with probability of being ill and found to be a significant determinant. Households with poor level of income are found to suffer illness more than those with higher income. Having electricity in the house has a negative relation with probability of suffering from acute illness, as such household are at least better off to be afford to pay for such facilities. Most of the district level variables, e.g. mortality rate (*morrate*), population (*lpop*- log of population), area (areacat, araecat_1 being the reference category), beds (bedcat – bedcat_1 being the reference with less than 200 beds in the districts), health human resources, were not found to have relationship with being reported to have illness (Table 2).

Table : 2 Determinants of the probability of illness (acute illness, chronic illness, and any illness.

	(1)	(2)	(3)	(4)	(5)	(6)
Variables	acute only	lnsig2u	chronic only	lnsig2u	illness	lnsig2u
_Isex_2	0.0168		-0.00690		0.00626	
	(0.0160)		(0.0160)		(0.0137)	
age	1.13e-05		-0.00208		-0.00200	
	(0.00152)		(0.00149)		(0.00129)	
age2	-1.68e-05		8.96e-05***		6.01e-05***	
	(2.03e-05)		(1.92e-05)		(1.70e-05)	
urbrural1	0.0577***		-0.00315		0.0363**	
	(0.0201)		(0.0203)		(0.0174)	
logfoodexp	-0.0977***		-0.0970***		-0.131***	
	(0.0174)		(0.0173)		(0.0149)	
_Iwallsmat_2	-0.0421*		-0.0275		-0.0470**	
	(0.0253)		(0.0253)		(0.0217)	
_Iwallsmat_3	-0.0450		-0.0215		-0.0457*	
	(0.0299)		(0.0299)		(0.0257)	
_Iwallsmat_4	-0.0232		-0.0213		-0.0300	
	(0.0275)		(0.0278)		(0.0238)	
_Iwallsmat_5	0.0213		0.192		0.144	
	(0.158)		(0.152)		(0.134)	
_Ielectrici_1	-0.00534		0.0217		0.0114	
	(0.0205)		(0.0207)		(0.0177)	
morrate	-0.00647		-0.00916		-0.0106	
	(0.00815)		(0.00951)		(0.00950)	
lpop	0.0841		0.100		0.115	
	(0.0792)		(0.0937)		(0.0918)	
_Iareacat_2	0.0105		-0.0669		-0.0290	
	(0.0867)		(0.102)		(0.102)	
_Iareacat_3	-0.000366		-0.0536		-0.0310	
	(0.103)		(0.120)		(0.121)	
_Ibedcat_2	-0.148		0.00680		-0.0995	
	(0.0983)		(0.116)		(0.116)	
_Ibedcat_3	-0.164		-0.00449		-0.118	
	(0.144)		(0.169)		(0.170)	
lalloc	-0.0230		0.0102		-0.00648	
	(0.0656)		(0.0771)		(0.0776)	
humr_1	-0.0944		-0.00927		-0.0764	
	(0.0912)		(0.107)		(0.108)	
Constant	0.0129	-3.082***	-0.323	-2.738***	0.689*	-2.706***
	(0.348)	(0.206)	(0.400)	(0.213)	(0.395)	(0.199)
Observations	38,489	38,489	38,489	38,489	38,489	38,489
Number of districts	58	58	58	58	58	58

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

After we generated district level weights using inverse probability weights (see annex table 1) using the estimated demand function noted in Table 2, we than weighted the current allocation and found the difference between actual allocation and the need adjusted allocation in all districts. Table provided in Annex one also provide the weight. This estimates suggest that allocations needs to be adjusted if we would like the allocation to equitable, where equitable is considered as equal access for those with equal need. The following figure (Fig 1), which considered a few among the 64 districts, shows that some district may need around 200% downward adjustments, and some may even 70% upward adjustments.



1.4 Discussion and conclusion:

A need based allocation is important method to address the issue of equal access for equal need and is more import in low and middle income country, where regional disparities in development and socioeconomic conditions and health indicators are present. This issue is an important policy consideration. Given there exists poor data settings , we may consider use of

need based allocation by generating weights using inverse probability to adjust the actual allocation of health care expenditure across sixty-four districts of the country. The finding suggest significant adjustment are necessary for the current allocation to be equitable.

This finding generates policy debate and discussion to rethink about the existing level of allocation, and prioritization. This being independent assessment based on economic principles - can help policy makers to avoid political influences in decisions for allocating resources that may have helped concentration of health care resource in certain areas, which have remained over-funded for long.

It can be said that it is possible to estimate a need adjusted equitable level allocation with given data collected and maintained by the Ministry of Finance and special survey data. This study has used selected data for both the supply side model, and the demand side model. So, trying to have a robust need based allocation using existing data can be used for important policy decisions.

Instead of taking the total allocation, it may be useful to use the allocation for selected health care programme, where we may need to consider specific health outcome measures or measures for need. For example we may consider the allocation going to the health care facilities and directly going to health care services, and exclude the money going to teaching and academic purpose, and training purpose.

The other issue that is important to note is that it would be difficult to make immediate adjustment, hence the policy recommendation should also consider how the adjustments can be made with certain period of the time, whether we should keep the real allocation unchanged over certain period of time in the over funded district.

Further work can be done where data are available on utilisation of the health care, particularly use of public sector facilities.

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Annex 1: Actual allocation, adjusted allocation, and weights for adjustments from different illness model.

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. list district allocation proballoc probacute probchronic probill
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	district	alloca~n	probal~c	probac~e	probch~c	probill
1.	Bagerhat	147.288	121.5765	.3285418	.3189167	.5836976
2.	Bandarban	68.064	85.01893	.281113	.3035266	.5095211
3.	Barguna	83.1385	106.2107	.	.	.
4.	Barisal	411.168	292.5204	.	.	.
5.	Bhola	116.508	117.4718	.	.	.
6.	Bogra	362.298	241.4153	.3217308	.3196874	.5754227
7.	Brahmanbaria	151.635	137.0921	.283724	.2952208	.5024233
8.	Chandpur	162.897	130.4304	.3014562	.3047252	.5342792
9.	Chittagong	738.215	656.7899	.2879925	.2991008	.5120639
10.	Chudanga	65.0131	104.6405	.3153712	.3176389	.5648615
11.	Comilla	470.418	278.7128	.2843946	.2972816	.5055214
12.	Cox's Bazar	114.021	125.1055	.2989541	.2982753	.5241615
13.	Dhaka	3261.67	4385.591	.2931796	.3021919	.5210565
14.	Dinajpur	254.776	212.6964	.3140118	.3241886	.5709114
15.	Faridpur	286.888	205.1135	.3185736	.3108183	.5614291
16.	Feni	116.305	113.6441	.284183	.2978675	.5058203
17.	Gaibandha	163.46	127.7144	.3310522	.3181961	.5851397
18.	Gazipur	109.214	126.1876	.3069068	.3090502	.5452183
19.	Gopalganj	105.335	110.0653	.3069139	.3127687	.5502203
20.	Habiganj	132.844	126.6033	.3103444	.3055856	.5452806
21.	Joypurhat	127.007	107.9057	.3168464	.3295166	.5807403
22.	Jamalpur	87.487	162.2865	.3173136	.3094975	.5587493
23.	Jessore	168.496	194.0658	.3193104	.3245488	.5780579
24.	Jhalokati	194.112	100.8029	.	.	.
25.	Jhenaidah	71.1752	119.5919	.3150388	.3186233	.5658805
26.	Khagrachhari	88.9369	92.32331	.304774	.303977	.5381082
27.	Khulna	347.632	244.662	.3124219	.3156841	.5599145
28.	Kishoreganj	149.095	150.4649	.3288121	.302948	.5636221
29.	Kurigram	144.396	113.4189	.3313423	.3122066	.578348
30.	Kushtia	107.349	169.2858	.316924	.3167637	.56574
31.	Lakshmipur	85.6697	111.584	.2761543	.2920669	.490028
32.	Lalmonirhat	102.228	107.874	.3266236	.3094527	.5692887
33.	Madaripur	84.0562	146.5379	.3123718	.3083148	.5512321
34.	Magura	132.514	105.2757	.3344934	.3154414	.5855881
35.	Manikganj	47.9088	114.6769	.3012965	.3025672	.5309427
36.	Meherpur	107.244	98.58086	.2989691	.3143461	.541336
37.	Moulvibazar	119.804	118.7907	.3074274	.312151	.5488904
38.	Munshiganj	516.451	113.8426	.2903259	.3010975	.516346
39.	Mymensingh	189.29	372.3887	.3113176	.313271	.5553762
40.	Naogaon	60.1558	128.7246	.3171251	.3266443	.5775372
41.	Narail	147.255	98.5214	.3182852	.3132079	.5641347
42.	Narayanganj	130.595	147.1172	.2913567	.301281	.5179628
43.	Narsingdi	104.775	123.6012	.2954624	.3045573	.5266211
44.	Natore	99.3729	119.1227	.3299505	.323209	.5892993
45.	Nawabganj	160.272	104.1203	.3228332	.3177483	.5738362
46.	Netrokona	199.367	118.5864	.3172882	.3033805	.5509074
47.	Nilphamari	109.253	109.4388	.3398165	.3147584	.5914708
48.	Noakhali	175.996	201.5389	.2930681	.2973712	.5161278
49.	Pabna	213.385	242.1891	.3238297	.3091064	.5656705
50.	Panchagarh	75.6484	103.6322	.3352874	.315601	.5872709
51.	Patuakhali	118.634	163.1953	.	.	.
52.	Pirojpur	90.4959	110.4978	.	.	.
53.	Rajbari	85.6428	93.44327	.3080333	.3151341	.5533382
54.	Rajshahi	408.821	300.3564	.3293419	.30757	.5699438
55.	Rangamati	120.127	127.8508	.282189	.2997862	.5065942
56.	Rangpur	376.274	247.7381	.3264593	.3182113	.5793162
57.	Shariatpur	92.293	98.52287	.3073617	.302238	.5380742
58.	Satkhira	128.234	123.0581	.3208353	.3230374	.5779473
59.	Sirajganj	175.943	183.1235	.3144244	.3075024	.5522734
60.	Sherpur	87.772	99.19285	.3196935	.312272	.564519
61.	Sunamganj	139.845	118.484	.311775	.3116596	.5546227
62.	Sylhet	391.05	302.6183	.297836	.3071924	.5321497
63.	Tangail	271.354	224.4206	.3141463	.3098372	.5548387
64.	Thakurgaon	84.4145	111.8058	.3251341	.3180313	.5774705