Original Research Article

The Spatial Pattern of Health Facilities and Infrastructural Gaps in Dakshin Dinajpur, West Bengal

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Abstract: Healthcare facilities has generally been identified as a major indicator of development and social wellbeing of a society. It is a major complement to a strong, dynamic and progressive society. Health infrastructure is an important indicator to understand the health care delivery provisions and mechanisms in a region. This paper is an attempt to find out the level of health infrastructure in Dakshin Dinajpur. This paper also tries to identify the existing gaps in health care facilities and to provide some recommendations for improvement of infrastructure facilities to ensure the better service.

Keywords: Health infrastructure, Sub-centre, Primary health centre, Disparities, Spatial distribution.

1. Introduction

Health care is one of the most important aspects of the public policy of welfare states in the world. Health has been man's one of the greatest possessions of life and his source of real happiness. In terms of resources for socio-economic development, nothing can be considered of higher significance than the health of the people. The World Health Organisation (WHO) defines health as "A state of complete physical, mental and social wellbeing and not merely an absence of diseases or infirmity". Accordingly, health is a basic need of life which enables full utilization of all other facilities to make life better, richer and more meaningful. In many countries, a marked rural-urban disparity exists in the quality and availability of health care services. Generally, such services tend to concentrate in the few urban centres, leaving vast majority of the rural areas virtually starved. Such disparities needs to be brought down by providing accessibility to these facilities to the large majority of the masses living in the rural and backward areas.

2. Objectives

(1) To identify the major healthcare infrastructural facilities of the district;
(2) To examine the spatial distribution of health faculties in Dakshin Dinajpur District;
(3) To find out the health infrastructural gaps;
(4) To give some recommendations for improvement of infrastructure facilities.

3. Database and Methodology

The major data source for this study was secondary. Data are collected from census 2011, 2001 , district statistical handbook 2011, department of family and Welfare government of West Bengal, C.M.O.H Dakshin Dinajpur, DLHS-4. In the present study 11 indicators of infrastructure services have considered to construct the healthcare infrastructure index for Dakshin Dinajpur. This are:

(1) Number of PHC per 30000 population (X_1)
(2) Number of sub centers per 5000 population (X_2)
(3) Number of doctors per lakh population (X_3)
(4) Number of bed per 10000 population(X_4)
(5) Number of family welfare centers per 30000 population(X_5)

Received: 13 July 2023 Accepted: 13 August 2023 Available online: 16 December 2023

(6) % of village within 5 km from PHC(X_6)
(7) No of medical institution per 100 sq.(X_7)
(8) Number of nursing home per 50000 population(X_8)
(9) % of village with medical facilities(X_9)
(10) Maternity and childcare Centre(X_{10})
(11) Number of dispensaries(X_{11})

For the identification of level of development composite index calculated using following method-

The model of Z-score method is as follows:

$$Z = (X - \mu) \div \sigma \quad \text{(Eq.1)}$$

Where: Z = is the z-score; X is the value of the element; μ is the the mean of variable; σ is the standard deviation.

Gaps of different facilities are calculated by following formula: Fg = N-(P/Pt); Fg = Gaps for particular facilities; N = Existing number of facilities; P = Block population; Pt = Average population threshold for facilities.

4. Study Area

Dakshin Dinajpur has been selected as the region for present study. Dakshin Dinajpur or South Dinajpur is a district of West Bengal, created on 1 April 1992 by the division of the erstwhile West Dinajpur district. It comprises two subdivisions: Balurghat and Gangarampur. It lies in between 26˚35′15″N to 25˚10′55″N and 89˚00′30″E to 87˚48′37″E. Total area under Dakshin Dinajpur district is of about 2,219 sq.km. In 2011, Dakshin Dinajpur had population of 1,670,931 of which male and female were 855,104 and 815,827 respectively. There was a positional change of 11.16 percent in the population compared to population as per 2001. According to 2011 census it is the least one populated district of West Bengal. Dakshin Dinajpur is predominantly an agricultural district with large area of land being under cultivation. According to 2011 census 85.87% area is rural and 14.13% area urban in nature. This district comprises 1579 inhabited village, 2 municipality, 8 blocks, 65 Panchayets.

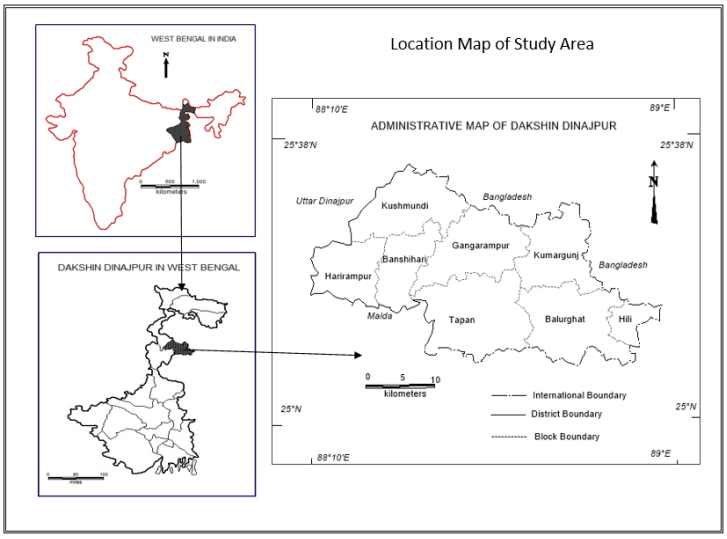

Figure 1 Figure caption.

5. Health Infrastructure of Dakshin Dinajpur

In case of health, the term infrastructure takes on a wider role than mere physical infrastructure. Healthcare centres, dispensaries, hospital facilities, equipment's, staff, medicines etc., are considered as health infrastructure. The health system of the district has showed that most of the health facilities are below the national as well as state level average. The bed and doctor ratio to the total population of the district and the state is 1298 and 851,

1804 and 12122. The rank of the district among the all district of West Bengal is 11 using composite index prepared by IIPS, 2006. The report health on March 2011 shows that total hospital of the district is 2 one is Balurghat district hospital and another is Gangarampur sub-divisional hospital. These hospitals act as the main hearth of the public health care system of the district. All the blocks have to depend on this district and sub-divisional hospital. There is only one rural hospital that is located at Hilli block. Total number of BPHC and PHC in the districts is 6 and 19. District level household and facility survey 2012–2013 shows 68% sub-centre located in governmental building, PHCs functioning on 24 × 7 hours 12.5%, villages with sub-health centre within 3 km 92%.

According to 2011 census it is shown than that only 39.06 percentage of village have medical facilities. The poorest condition found in Kumargunj with the percentage of 18.75. Moderate health facilities found in Hilli, Tapan blocks. Averagely good condition found in Kushmundi (72.81%)and Banshihari block (63.12%).

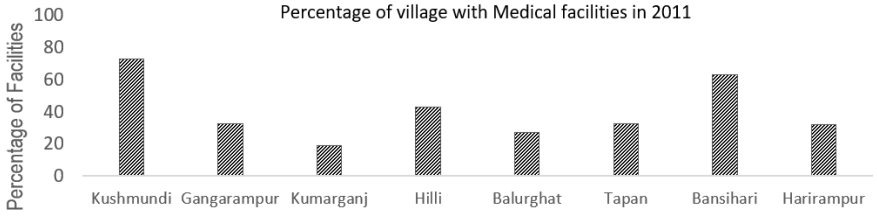

Figure 2 Figure caption.

5.1 Spatial Distribution of Health Facilities

Geographic variation in population, and population need for health care, provides the foundation for analysis and planning of health services. The distribution of healthcare facilities varies not only in rural and urban areas but also within rural and urban areas. The similar situation exists in Dakshin Dinajpur district. The public healthcare centres of the district includes district hospital, block hospitals, community health centers, primary health centers, sub centers, mobile medical units which are tied up to the nearest government healthcare centers, government hospitals. Spatial distribution of health facilities is not equally distributed over the district. The data of statistical handbook of the district 2011 shows that district has two district hospitals one at Balurghat and another at Gangarampur subdivision. Total BPHC in the district has 6 among 3 at Gangarampur subdivision and 3 at Balurghat subdivision. Gangarampur and Hilli block without any BPHC. The district census handbook 2011 shows total 52 primary health centres in the district which distributed unevenly over eight blocks. Maximum number of PHC concentred in Balurghat (12), Tapan (13), and Banshihari (12) and least number of PHC concentred in Harirampur (2), Kushmundi (2), and Hilli (2), blocks. Table 1 shows the distribution pattern of health facilities of the district.

Table 1 Health facilities In Dakshin Dinajpur 2011.

	Community health centre	Primary health centre	sub centre	Maternity and child welfare centre	Hospital-allopathic	Hospital-alternative medicine	Dispensary	Mobile health clinic	Family welfare centre	Medicine shop
Kushmundi	4	2	14	2	2	0	5	2	3	39
Gangarampur	0	3	29	9	0	0	4	0	1	13
Kumarganj	2	6	24	0	0	0	1	0	0	13
Hilli	0	2	12	6	1	1	3	2	2	17
Balurghat	2	12	48	1	0	1	7	0	1	23
Tapan	1	13	38	2	5	1	10	0	0	20
Bansihari	12	12	17	89	0	0	1	0	26	17
Harirampur	0	2	10	3	1	0	2	3	2	19
District	21	52	192	112	9	3	33	7	35	161

Source: *Census of India 2011*

6. Infrastructural Gaps

When we compared to the desirable national norms for the rural healthcare system in Dakshin Dinajpur all the blocks are seen to suffer from moderate to severe mismatches between existing block-level healthcare facilities and the current block population.

Table 2 Table caption.

Item	Norms
At least one dai	For each village.
One trained village guide	For each village per 1000 population.
One sub-centre	For 5000 population in plain areas and 3000 in tribal, hilly, backward areas.
One primary health centres	30000 poulation in plain areas and 20000 in tribal, hilly, backward areas.
One community health centres	More than 1 lakhs poulation areas.

Source: *Planning commission.*

There is wide gaps between required and exiting health facilities such as sub-centres and primary health care in different blocks of Dakshin Dinajpur district.

6.1 Gaps in Subcentres

According to planning commission per 5000 there should be sub centres. But in Dakshin Dinajpur the situation is far away from the reality. Average population serve per subcentres in the district is 7,500. This is really mismatch condition. The situation is same to all over the block except Balurghat block. Worst condition found in Kushmundi and Harirampur block where population served per sub centres is 14,196 and 13,183.

Table 3 Table caption.

Blocks	Population	Average threshold population	No of existing facilities	No of required	Gaps
Kushmundi	198752	7500	14	27	-13
Gangarampur	230612	7500	29	31	-2
Kumarganj	169102	7500	24	23	1
Hilli	83754	7500	12	11	1
Balurghat	234139	7500	48	31	17
Tapan	250504	7500	38	33	5
Bansihari	141286	7500	17	19	-2
Harirampur	131832	7500	10	18	-8

Source: *Computed by author from census of India 2011.*

Average threshold population for subcentre is 7,500 in the district. Lowest number of sub centres found in Kushmundi block. Number of existing sub centres is 14 and number of required is 27. So, gap is higher in this block. Total 13 sub centre deficient according to population norms. Gaps between existing and required also found in Harirampur, Banshihari and Gangarampur block. Blocks having surplus subcentre are Balurghat (17), Tapan (7), Kumargunj (1), Hilli (1).

6.2 Gaps in Primary Health Centres

Unbalance condition also found in the case of primary health centres. Except Banshihari, Tapan and Balurghat all the blocks are below national average of population served per primary health centres. Worst condition found in Kushmundi and Gangarampur. These two blocks population per PHC is 99,376 and 76,870

population.

Average threshold population for primary health centre is 27,692 in Dakshin Dinajpur district. Four blocks among eight shows surplus in primary health centres. Highest surplus in Banshihari block. Number of primary health centre is 12 and number of required 5, the surplus is 7. Other blocks such as balurghat (4), Tapan (4) also shows positive value of primary health centres. Gaps in high Kushmundi and Gangarampur block. The gaps between existing and no of required is 5. Only one block that Kumargunj shows balance condition between no of existing and no of required facilities.

Table 4 Table caption.

Blocks	No of village	Population	Average threshold population	No of existing facilities	No of required	Gaps
Kushmundi	228	198,752	27,692	2	7	-5
Gangarampur	198	230,612	27,692	3	8	-5
Kumarganj	208	169,102	27,692	6	6	0
Hilli	79	83,754	27,692	2	3	-1
Balurghat	294	234,139	27,692	12	8	4
Tapan	271	250,504	27,692	13	9	4
Bansihari	160	141,286	27,692	12	5	7
Harirampur	144	131,832	27,692	2	5	-3

Source: *Computed by author from census of India 2011.*

6.3 Gaps in Family Welfare Centres

Average threshold population for primary health centre is 41,142 in Dakshin Dinajpur district. All blocks shows deficient in family welfare centres. Gaps in deficiency is high in Tapan (5) and Kushmundi (4) blocks. Lowest gaps found in Kumargunj (1), Hilli (1) blocks.

Table 5 Table caption.

Blocks	No of village	Population	Average threshold population	No of existing facilities	No of required	Gaps
Kushmundi	228	198,752	41,142	1	5	-4
Gangarampur	198	230,612	41,142	3	6	-3
Kumarganj	208	169,102	41,142	1	2	-1
Hilli	79	83,754	41,142	1	2	-1
Balurghat	294	234,139	41,142	3	6	-3
Tapan	271	250,504	41,142	1	6	-5
Bansihari	160	141,286	41,142	1	3	-2
Harirampur	144	131,832	41,142	1	3	-2

Source: *Computed by Author from statistical handbook 2011.*

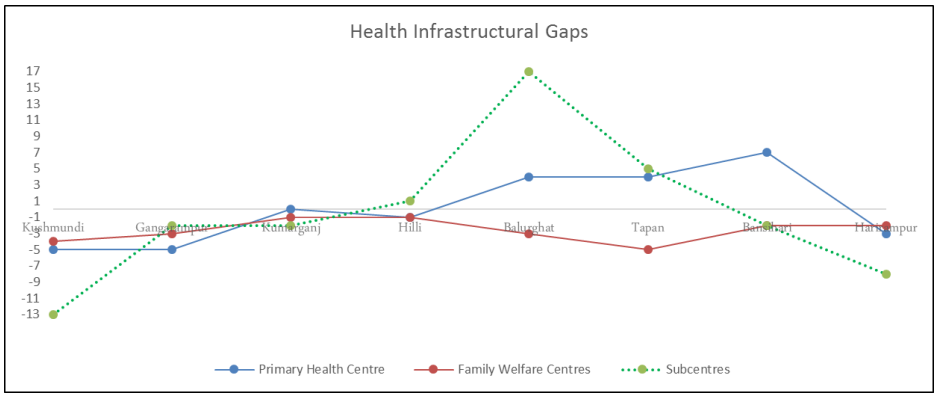

Figure 3 Figure caption.

7. Doctor and Bed Ratio

Doctor and bed ration is the one of the qualitative measurement of health system. The study area Dakshin Dinajpur show very critical situation. Doctor and bed ratio of the district is below the average state level ratio. Doctor and bed ratio of West Bengal in 2010 was 851 and 1,804 where in Dakshin Dinajpur it is 1,298 and 12,122. **Table 6** shows that mismatch ration of doctor and bed ratio. The bed ration per 10,000 population is higher at Gangarampur (11.22) and Balurghat (14.57). Poor condition found at Tapan (2.72),,Kushmundi(2.01) ,Kumargung (2.72). The doctor ratio per Lakh population higher at Balurghat (17.11) and lower at Tapan(3.19).

Table 6 Table caption.

Block Name	Doctor Ratio	Bed Ratio
Harirampur	3.79	3.18
Banshihari	3.53	3.25
Kushmundi	5.3	2.01
Gangarampur	6.27	11.22
Tapan	3.19	1.63
Kumargung	7.73	2.72
Balurghat	17.11	14.57
Hili	8.35	4.05

Source: *Computed by author from census of India 2011.*

7.1 Gaps in Bed and Doctors

Average threshold population for Bed is 3,165. The table below shows that Balurghat having 94 surplus in bed where Gangrampur block shows 36 bed required. There is a wide gap in bed facilities in the district. Harirampur block shows balance condition between existing and required number of bed. Surplus bed also found in Hilli(8) and Banshihari (1) block. There is wide gaps betwwen number of existing and required bed in Gangarampur (36), Kushmundi (23), and Tapan (37).

Average threshold population for doctor is 12973. Exept balirghat, hilli and Gangarampur also blocks are lagging behind in doctor facilities. Balurghat is the district headquatar as well as main administrative town in the district. That is why main hospital and health facilities concentrate here. So, doctor ratio also high in this block. Surplus of 28 in doctor found in this block. The highest gaps identified in Tapan (10), followed by Kushmundi (7), Kumargunj (7) Banshihari (5).

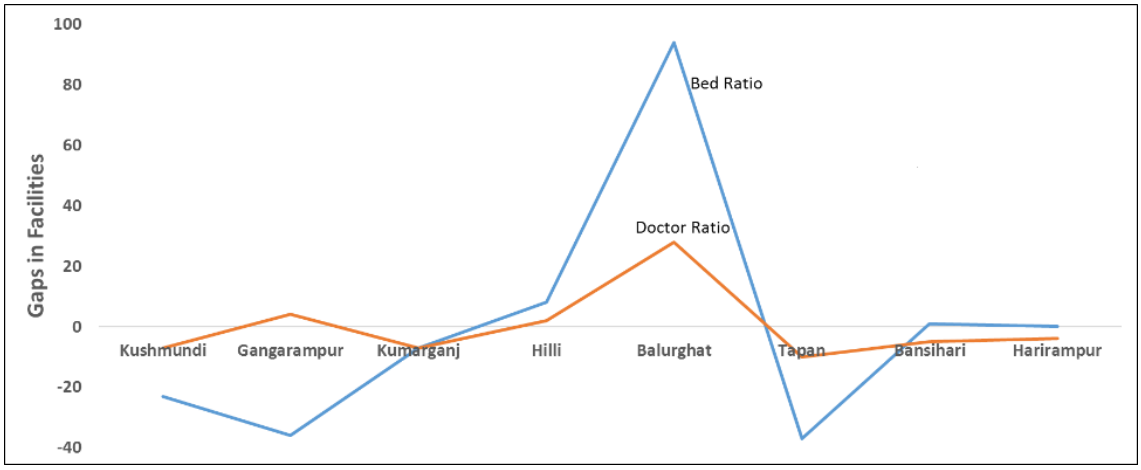

Figure 4 Figure caption.

8. Composite Index of Healthcare Infrastructure

Composite index prepared using Z score to determine the level of development of different blocks of Dakshin Dinajpur. Total 15 parameters that pertaining to health facilities are used. The analysis classified three distinctive level of development i.e. High, moderate and low development blocks.

Table 7 Table caption.

Blocks	ZX_1	ZX_2	ZX_3	ZX_4	ZX_5	ZX_6	ZX_7	ZX_8	ZX_9	ZX_{10}	ZX_{11}	Composite Index
Kushmundi	-0.34	-0.54	-0.35	-0.68	-0.84	-0.91	-0.85	-0.72	1.75	-0.39	0.278	-0.33
Banshihari	-0.84	-1.11	-0.74	-0.43	-0.07	-0.91	-0.26	1.01	1.23	2.46	-0.67	-0.03
Hariramp	-0.79	-0.97	-0.68	-0.44	0.04	-0.25	-0.77	-0.72	-0.44	-0.36	-0.99	-0.58
Gangarampur	-0.90	-0.54	-0.14	1.22	1.07	0.17	0.53	1.36	-0.42	-0.16	-0.03	0.19
Kumargunj	0.94	1.43	0.18	-0.54	-0.59	-0.53	-0.49	-0.72	-1.15	-0.45	-0.99	-0.26
Tapan	-0.06	0.30	-0.81	-0.76	-1.3	0.37	-0.98	-0.72	-0.41	-0.39	1.87	-0.27
Balurghat	0.049	1.43	2.24	1.91	0.04	-0.10	1.22	1.21	-0.69	-0.42	0.91	0.71
Hili	1.95	0.017	0.31	-0.26	1.71	2.18	1.61	-0.72	0.15	-0.26	-0.35	0.57

Source : *Computed by autor.*

8.1 High Level of Health Development (0.26 To 0.60)

With composite mean Z-score more than 0.26, two blocks, i.e Balurghat , hilli lies under high level of development. All parameters of health development are positive values. Near about 25 percent of area under this category. Composite score of Balurghat blocks is 0.70. Balurghat enjoys an advantage of location of district head quarter and are having different types of medical facilities, moreover, well connectivity with means of transportation and communication facility. Number of subcentres, doctor ratio, denpensar is high in Balurghat. In Hilli number of primary health centre per 30,000 population high (1.95).

8.2 Medium Level of Health Development (-0.16 To 0.26)

The blocks with composite mean Z-score ranging -0.16 to 0.26 are categorised under the medium level of health development. It consist two blocks namely Banshihari and Gangarampur. It comprises 25 percent of the area of the district. In gangarampur number of bed per 1,000 population, number of medical institution per 100 sq km, number of nursing home, accessibility of PHC has a positive score. Number of meternity and childcare facility is high in Banshihari block.

8.3 Low Level of Health Development (-0.16 To -0.58)

Most of the blocks of the district fall under low level of development 50 percent of the area under this category. It consist four block namely Harirampur (-0.58), Kushmundi (-0.33) , Tapan (-0.27), Kumargunj(-0.26). Most of the development parameters are negative score. This blocks experience with low level medical facilities, transport and communication facilities.

9. Major Finding and Conclusion

The above analysis brings into spatial sharps variation of health infrastructure of the district. Dakshin Dinajpur are still unable to access proper health facilities as the health care delivery system is very poor here. In every stage of the health care system, a mismatch exists between the required and available health facilities. According to 2011 census it is shown than that only 39.06 percentage of village have medical facilities. The poorest condition found in Kumargunj with the percentage of 18.75. Moderate health facilities found in Hilli, Tapan blocks. Averagely good condition found in Kushmundi (72.81) and Banshihari block (63.12).

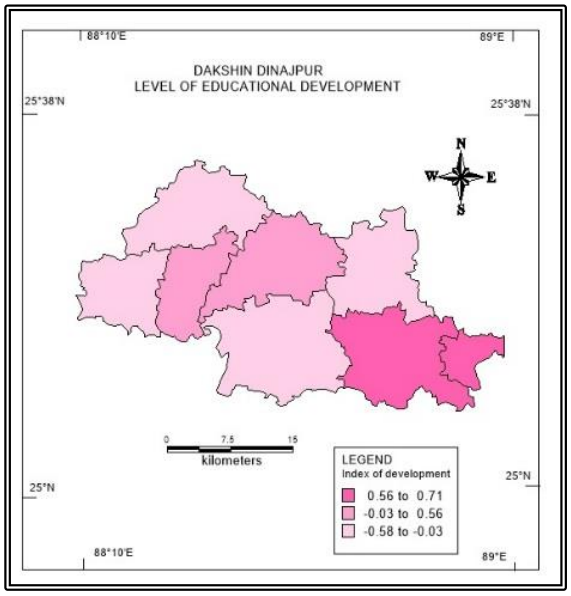

Figure 5 Figure caption.

District have only one district hospital and one sub-divisional hospital. Balurghat, Gangarampur, Hilli block apparently developed where, Harirampur, Banshihari, lower level of health facilities. Doctor and bed ratio of the district is below the average state level ratio. Doctor and bed ratio of West Bengal in 2010 was 851 and 1,804 where in Dakshin Dinajpur it is 1,298 and 12,122. The success of human resource development programmes depend considerably on the health condition of the people. To cope up with the situation, adequate medical and health care facilities are in urgent need. As a strategy to improve the condition by making the necessary facilities available, the present hospital-population ratio of 1:160,000 has to be brought down to at least 1:20,000 and to achieve the target at additional 14 hospitals would have established in the area. In the case of primary health centres Gangarampur and Balurghat needed 2 aditional PHC and Kumargunj needed 1 PHC. Kushmundi block needs additional 13 subcentres Harirampur needs 8. Total existing family welfare centres in the district are 10 and it should be increased to 35 for balance condition. A Medical College should be set up here as the tertiary stage of health care system is non-existent in this district. Accessibility of health centres should be increased. This possess a great challenge to planner for special planning strategy. The health care infrastructure should be developed in an organized manner. The number of health institutions must be increased following the national norms to cope with the pressure of population. Government need to commit a sizeable proportion for health infrastructure to meet the health demand for the growing population in the district. The participation of the private should be encouraged so that it can complement the services.

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Appendice

Appendice 1 Variables of health infrastructures.

Blocks	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}
Kushmundi	0.3	0.75	5.3	2.01	0.15	0	1.28	0	72.81	2	5
Banshihari	0.21	0.67	3.53	3.25	0.21	0	2.03	0.35	63.12	89	2
Harirampur	0.22	0.69	3.79	3.18	0.22	14	1.39	0	31.92	3	1
Gangarampur	0.2	0.75	6.27	11.22	0.3	23	3.06	0.42	32.32	9	4
Kumargunj	0.53	1.03	7.73	2.72	0.17	8	1.74	0	18.75	0	1
Tapan	0.35	0.87	3.19	1.63	0.11	27	1.12	0	32.47	2	10
Balurghat	0.37	1.03	17.11	14.57	0.22	17	3.94	0.39	27.21	1	7
Hili	0.71	0.83	8.35	4.05	0.35	65	4.44	0	43.04	6	3