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Capability and Well-Being in the Forest Villages and Tea Gardens in Dooars Region of North Bengal

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CAPABILITY AND WELL-BEING IN THE FOREST VILLAGES AND TEA GARDENS IN DOOARS REGION OF NORTH BENGAL

A study based on Minor Research
Project sponsored by the University
Grants Commission (India)

2014



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Cover illustrations (from top): (i) children from Rava community perform traditional dance during survey at Dhumchi forest village; (ii) Adivasi children witness outsiders during survey at Titi forest village; (iii) a tea garden in Dooars; (iv) watch tower in Central Dooars to prevent elephant attack (left).

[Note: Throughout the book Alipurduar has been treated as a Sub-division of the Jalpaiguri district. However, it got the status of a new (20th) district of West Bengal on 25 June 2014.]

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The term 'Dooars' is derived from the word 'doors' meaning doors to Bhutan and Tibet. This region forms a gateway to Bhutan and Tibet (with several such mountain passes) and the hill stations of North Bengal, Sikkim, and other north-eastern hilly States of the Country. It houses India's two most important national reserve forests namely, Gorumara National Park and Jaldapara Wild Life Sanctuary with as many as 78 forest villages and 150 major tea gardens inhabited by nearly 30 ethnic communities^{1, 2, 3, 4}.

Illustrations (from top): (i) on the way towards Mendabari forest village; (ii) photogenic view of southern Bhutan adjacent to Dooars.



1. Executive Summary

Forest villages and tea gardens of Dooars in India were created as public and private estates respectively during the latter half of the 19th century under the British rule conscripting local and migrated tribal people into bonded labour relationship. Although issues and strategies with organisation and governance as well as contexts of the labourers have undergone extensive changes over the centuries, lives and capabilities of the region remained somewhat unknown to the rest of the world. This study tries to bridge the gap by investigating quality of life related issues especially about how the forest villagers and tea-plantation workers of the region are provided with the basic capabilities to participate in and to contribute to society. Empirically, it studies, first, living conditions of the inhabitants; second, the burden of disease, disability and injuries in the region; and third, health seeking behaviour according to type of care and system of medicine. The study is mainly based on primary data collected through interviews and visits during 2012-2013 covering 400 households in the region. It applies simple algebraic and statistical tools including those in public health, and multivariate logistic regression analyses.

Although forest villagers and tea-plantation workers are undoubtedly poor, in respect to housing amenities and sanitation their condition is better than the average condition prevailing in the rural areas of the district, Jalpaiguri. They are moderately educated where average years of schooling for the population aged 15 and above are 3.5 and 4.8 in the forest villages and tea-plantation areas respectively. However, significant differences exist in terms of access to food between these two types of residential clusters. While an index of the same shows a value of 0.77 in 0-1 point scale for the forest villagers, the value for the latter appears to be 0.47 only. In regard to morbidity, communicable and infectious diseases predominate in the region (49-51 %) followed by non-communicable diseases (46 %) and injuries (2-5 %). In regard to disability, two per cent of the forest villagers are functionally disabled and 1.9 per cent are physically challenged. Such percentage figures for the latter are 3.4 and 1.2 respectively. Although provision of health care is almost invisible within the proximity of the residential clusters, many of the health seekers travel outwards to utilise public care (36-40 %). Reliance on self-treatment or else (15-32 %) and that on private care (28-49 %) are seen high. Preference for Allopathy is quite high (58 - 81 %) in contrast to that of the traditional systems (18-41 %). Multivariate analyses show that health seeking behaviour is significantly correlated with the characteristics of disorder. Finally, primary livelihood activities in the forest villages are seen as affected by man-animal conflicts and not all the alternative livelihood activities are found desirable and it warrants appropriate policies or attention.



... It's a tale of two localities: forest villages and tea gardens in Dooars region of North Bengal (West Bengal, India). The former emerged (as public estates) in response to paucity of labour forces inside or near the forest area with the beginning of conservation of forests in Bengal in 1864. The Forest Department, in order for intensive tending, conscripted local tribal people first and then migrated ones (surplus labourers from tea estates) into a 'bonded labour relationship' at little cost. They were engaged in forestry works like raising of plantation, protection works, etc. Some forest areas were cleared to grow up cereals and vegetables for the villagers^{5, 6, 7, 8}.

Illustrations (from top): (i) a hut at Titi forest village; (ii) a tea garden in Central Dooars.



2. The study area

The valley of the Dooars in North Bengal stretches from River Teesta on the west to River Sankosh on the east, over a span of 130 km by 40 km, forms a major part of the district of Jalpaiguri which lies between 26° 16' and 27° 0' north latitude and between 88° 4' and 89° 53' east longitude and looks like an irregular rectangle. The total area of the district is 6245 sq km., out of which the area under forest land is 1790 sq km. (28. 67 %) ^{1, 2} and is divided into four divisions and houses 78 forest villages (with nearly 75000 population) as shown in table 1.

There are as many as 150 major tea gardens in Dooars (with nearly 0.15 million people) spreading across three sub-divisions of the district as shown in table 2. Alipurduar, which stretches from eastern to central Dooars, has been selected under this project.

Ten forest villages were selected in Cooch Behar Wildlife Division III and covered in the first phase of the survey during January - March 2012. Similarly, five broad localities in the tea-plantation belt of Alipurduar were selected to cover ten sampling units (residential clusters) in the second phase of the survey during December 2012 - May 2013. The following maps and table show details of the study area and size of sample. The places marked with asterisks indicate selected forest villages and localities in tea-plantation areas.

Among the forest villages, Titi is located in the extreme north, which is close to the border of Bhutan. In the extreme south, there are two (from left to right): Kurmaibasti and Andu. The other two, just above these (from left to right), are Salkumar and Bania respectively. In the extreme west, we have Dhumchi followed by North Khairbari. In the middle, from south-east to north-west, we have three: Uttar Mendabari, Mantharam and Kodalbasti respectively. The areas covered during the first phase of the survey are marked with red asterisks in the maps.

Table 1. Forest villages in Dooars of North Bengal

Divisions	Forest villages
Jalpaiguri	20
Jalpaiguri Wildlife Division II	6
Buxa (Tiger Reserve)	37
Cooch Behar Wildlife Division III	★ 15
Total	78

Source: Paschimbanga, Vol. 34, Nos. 48-50, p. 30, 2001

Selected area is marked with red asterisk

Table 2. Tea gardens in Dooars of North Bengal

Subdivisions of Jalpaiguri	Major tea gardens
Alipurduar	★ 58
Jalpaiguri Sadar	42
Malbazar	50
Total	150

Source: Self elaboration & www.teaboard.gov.in/pdf/directory/Registered_Tea_Estate.pdf. [Accessed: 04 February 2014]

Selected area is marked with orange asterisk



Forest villagers were provided with hutments with basic amenities, free access to firewood for personal use, etc. with one primary school in each village and visiting doctor to cater their need in isolated areas. However, they were denied rights to property. These persisted after independence, and it was only in recent past some developmental works began with the inception of three-tier Panchayet Raj System in the forest villages. As the need for such labour declined and decentralisation in governance is on, the issues relating livelihood and property rights drew enormous attention in these days ^{5, 9, 10}. The need for the present study with a scientific outlook is thus justified.

Illustrations (from top): (i) a lonely path through Chilapata forest; (ii) way through a tea garden in Central Dooars.



Table 3. Selected forest villages: Cooch Behar WLD III

Name of the Range	Name of the forest village	Households covered	Persons covered
Chilapata	Andu	20	101
	Bania	20	97
	Kurmaibasti	20	120
	Uttar Mendabari	20	105
Jaldapara South	Salkumar	20	113
Kodalbasti	Kodalbasti	20	102
	Mantharam	20	88
Lankapara	Titi	20	107
Madarihath	Dhumchi	20	98
	North Khairbari	20	106
Total	-	200	1037

Table 4. Selected tea-plantation areas: Alipurduar

Name of the broad area	Sampling Units / Cluster. Nos.	Households covered	Persons covered
Buxa	I / 4	20	85
	II / 5	20	90
Central Dooars - Rangamati	I / 9	20	112
	II / 10	20	101
Gangutia	I / 7	10	53
	II / 8	20	114
Kalchini	I / 1	30	136
	II / 6	20	97
Raimatang	I / 2	20	112
	II / 3	20	101
Total	-	200	961

Selected localities in the tea-plantation area are shown in the fourth map marked with orange asterisks. Rangamati is shown at the extreme north having a common border with the industrial district of Pasakha Lam, Bhutan with Gangutia at the bottom. The other three (Raimatang, Kalchini and Buxa) are shown at the middle forming an isosceles triangle.

Data collection is done primarily through interview technique. However, in order for comparison of living conditions in the forest villages and tea-plantation areas with those of usual revenue villages of the district of Jalpaiguri, we use data from District Level Household Survey-3 (2007-2008).

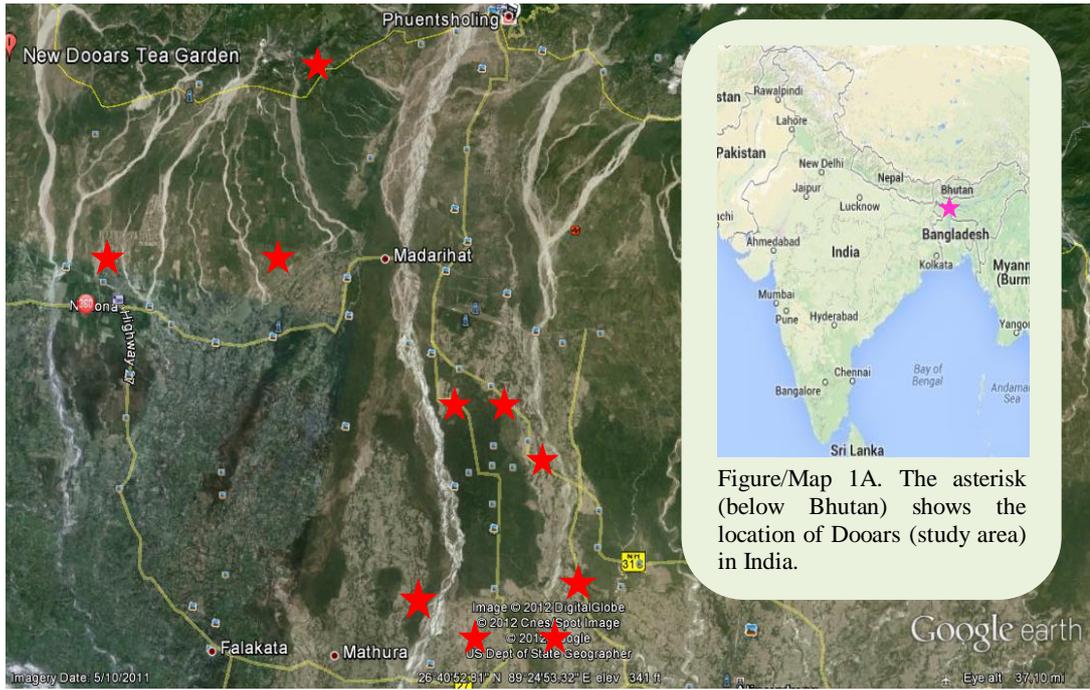
Selection of households was based on simple systematic sampling technique with the objective of widest geographical coverage within each sampling unit. Twenty households (or mentioned otherwise) have been selected from each unit leading to 1037 and 961 persons in the forest villages and tea gardens respectively. Where the village is demarcated according to ethnicity, sample is drawn proportionately from each category. Information were gathered on the following: household characteristics, demographic characteristics, epidemiological profile with utilisation of care, livelihood activities, etc. The reference period in regard to epidemiological profile and use of health care, etc. has been one year.



Tea gardens in Dooars (in line with the forest villages), started emerging as private estates (commercial estates under private ownership) since 1874 after the British rulers enacted waste land act to establish tea gardens on fallow lands in forest clusters to promote export of tea from this region. The British rulers did not allow local folks to work in these tea gardens. They brought labourers largely from Chotonagpur, Ranchi, Shingbhum, Odisha, Madras, and Nepal. And their condition did not differ much from that of bonded ones. As and when the industry faced the problem of surplus labourers, the issue was solved by pushing them towards the adjacent forest villages of the region ^{6,7}.

Illustrations (from top): (i) homestead at Mantharam forest village; (ii) residential area in a tea-plantation area at Kalchini.





Figure/Map 1A. The asterisk (below Bhutan) shows the location of Doars (study area) in India.

Figure/Map 1. Part of study area showing ten selected forest villages (with red asterisks)



Figure/Map2A. Bania forest village

Figure/Map2B. Kurmai Basti forest village

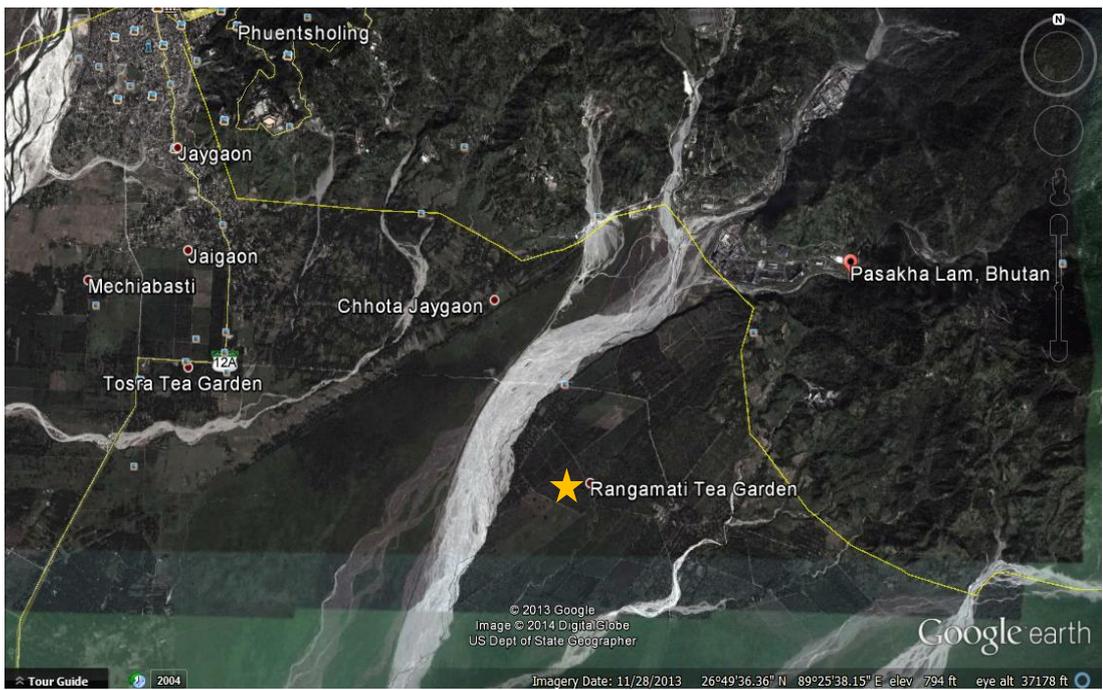
Figure/Map 2. Ariel views: Kodalbasti, a forest village under the Kodalbasti Range



Figure/Snap 3. Ground view of the Kodalbasti forest village



Figure/Map 4. Part of study area showing five broad localities in tea-plantation zone



Figure/Map 5. Ariel view of Rangamati region with Pasakha industrial area in the north-east



Figure/Snap 6. Ground view of the Rangamati and Pasakha regions from Indian side

3. Characteristics of the sampled population

We begin with the age-structure of the sampled population according to gender, as shown in population pyramids (appear below). The green panel shows percentage of female population and the other shows percentage of male population. The size of sample in the forest villages has been 1037, out of which, there are 489 (47.2%) female and 548 (52.8 %) male. Average age of the population is 27.08 years (mean); and the median age is 24 (which divides the population into two equal halves).

The size of sample in tea-plantation areas has been 961, out of which, there are 489 (50.9 %) female and 472 (49.1%) male. Average age of the population is 30.1 years (mean); and the median age is 27. So, comparatively residents in the tea-plantation areas are aged then the forest villagers. Also the latter has the advantage of having greater percentage of economically active population. However, proportion of female population aged 65 and above is comparatively higher in the forest villages. These are clear from the population pyramids as well as from table 5.

Gender ratios (ratio of males to females) in the forest villages and tea gardens are: 1.12 and 0.96 respectively.

Classification according to caste and religion is shown in figures 9-12. In forest villages, 96 per cent of the sampled population belong to the Scheduled Tribe category followed by categories of General (2.1 %) and Scheduled Caste (1.8 %). If we classify according to ethnicity, such as Rava (and Mech) vs. Adivasi, 60.4 per cent of the sampled population belong to the former and 39.6 per cent to the latter. If we consider religious categories, 55.5 per cent are Hindus and 44.5 per cent belong to Christianity.

In tea-plantation areas too majority of the population (84.8 %) belongs to Scheduled Tribe category followed by the categories of General (8.3 %), Other Backward Class (3.9 %) and Scheduled Caste (3 %). If we consider religious categories, 61.2 per cent are Hindus, 23.8 per cent are Buddhists, 13.8 per cent are Christians and 1.1 per cent are Muslims.

Table 6 shows characteristics of the sample according to work and age. The category of functional disability means inability to perform economic activities. Further, persons migrated out for work are included, as a 'de jure' method is followed.

Table 5. Age distribution in three broad groups (%)

Age group	Forest village		Tea-plantation area	
	Female	Male	Female	Male
0-14	29.9	26.8	19.7	19.0
15-64	64.1	70.6	76.9	78.3
65+	6.0	2.9	3.4	2.7



Sign of such a spatial disorganisation is still visible today as I tried to present it in maps in the second panel. For example, map 2 shows a forest village, Kodalbasti. It has residential areas as well as cleared up forest land for cultivation. The highway has demarcated the village almost into two equal halves. The so-called local tribes, Rava (who has been residing in this region since before the British period with Mech and others ⁴) reside in the northern part of the village and the Adivasi people (the surplus labourers of tea gardens, who were brought to this region under the British rule) live in the south.

Illustrations (from top): (i) children in a tea garden near Kalchini; (ii) with great grandmother in a Rava community in a forest village.



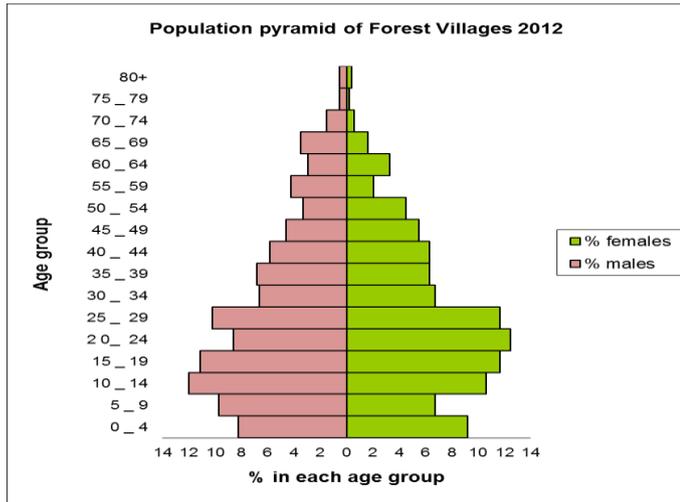


Figure 7. Age-structure in the forest villages: 2012

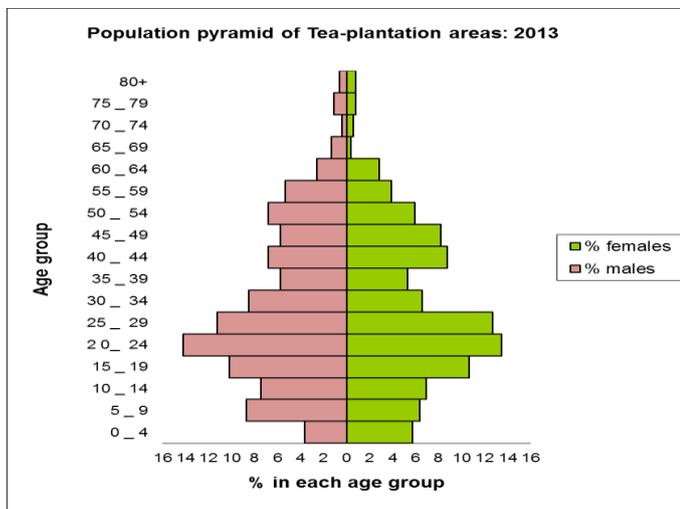


Figure 8. Age-structure in the tea-plantation areas: 2013

Table 6. Sample characteristics according to work and age

Work status	Forest villages		Tea-plantation areas	
	n	%	n	%
Children (1-5)	64	6.2	38	4.0
Daily labour	76	7.3	96	10.0
Farming	222	21.4	0	0.0
Functional Disability	21	2.0	33	3.4
Household work	235	22.7	174	18.1
Infant (0-1)	26	2.5	6	0.6
Migrated out for work	37	3.6	5	0.5
Pensioner	2	0.2	8	0.8
Public representative	2	0.2	2	0.2
Self-employed	26	2.5	20	2.1
Student	280	27.0	252	26.2
Unemployed	9	0.9	31	3.2
Salaried	31	3.0	10	1.0
Tea-plantation worker	6	0.6	286*	29.8
Total	1037	100	961	100

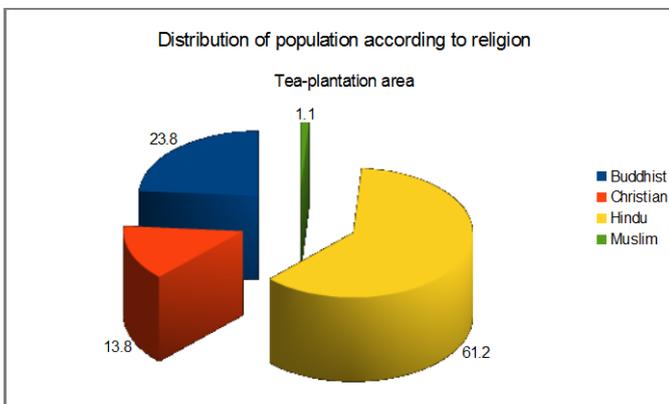
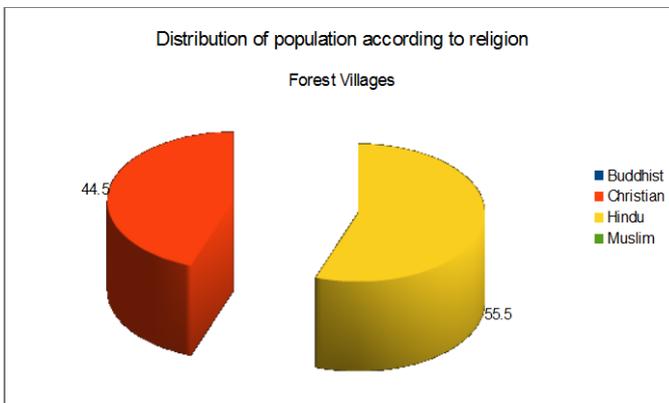
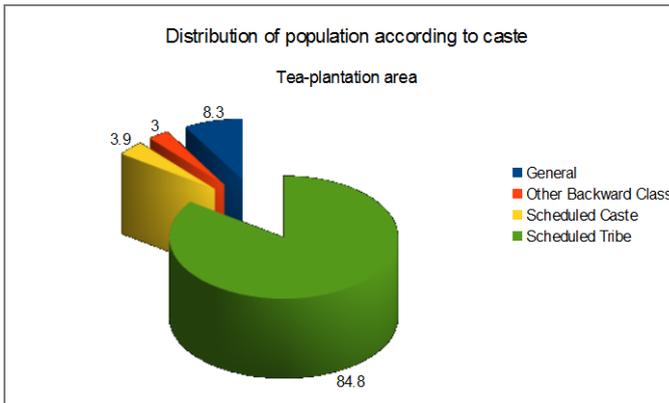
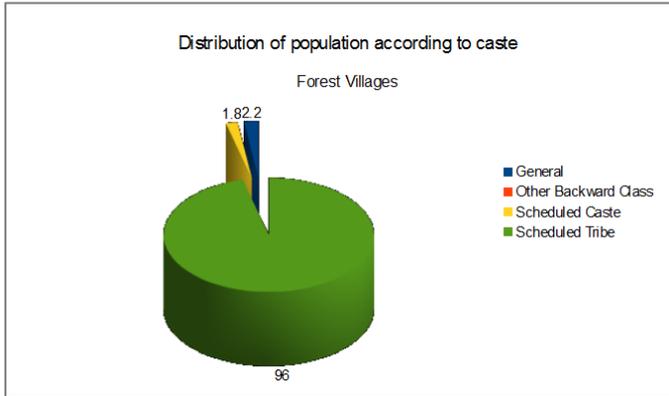
* Female: 135, Male: 151



Peculiarity in habitation due to the said spatial disorganisation is prominent in some other forest villages too as shown in maps 2A and 2B in the inset of map 2. For example, map 2A shows the forest village, Bania, where the Adivasi people live at the extreme north and the Rava community at the extreme south. Similarly, at Kurmaibasti, the Ravas live at the extreme east and the Adivasis in the extreme west. Cultivable land remains at the middle. All these are my recent observations, which I did not know earlier. These may have importance from ethnographic point of view. However, I tried to understand whether there exists any difference in terms of education, living conditions, preference for health care, etc.

Illustrations (from top): (i) life as seen in a forest village; (ii) snap from a tea garden.





The tale features some other dimensions too, when we consider interaction of these special groups of people living in two types of localities with economy and environment. As decentralisation in governance is on in the publicly managed forest villages, one can study the issue from the point of view of public economics. Further, it is understood that life in the forest villages has less interaction with the market economy than it does in the tea industry. One can compare state and plight of people in these two setups and make scientific enquiry on this point in this era of liberalisation and globalisation. One can also view the problem from the point of view of resource and environmental economics.

Illustrations (from top): (i) Adivasi lady drying paddy in a forest village; (ii) Rava girls drying paddy in a forest village.



Figures 9-12. Classification of population according to caste and religion in the forest villages and tea-plantation areas

4. Living conditions

Selected indicators of living conditions in the forest villages and tea garden areas are shown in Table 7. We see that with respect to housing, condition of the forest villagers and tea-plantation workers lie below the district average. Between the two, the condition is better in the former than in the latter, as 65 per cent of the houses have semi-pucca and wooden structures.

With respect to sanitation (use of toilet), majority of the households use their own or shared toilet in tea gardens. More than 40 per cent of the houses in the forest villages neither have toilet within housing area structure nor do they use any type of shared facility.

In regard to source of drinking water, nearly all residents in tea gardens use tap water made available by the estate management. In the forest villages, 64 per cent of the houses have hand pump provided either by the Department of Forests or Government through Panchayet Raj System. On the question of electricity, we see that 74 per cent of the houses in forest villages are electrified. On the contrary, nearly 57 per cent of the houses are electrified in the district as well as in the tea garden areas. In regard to use of domestic fuel, we see that nearly all households in forest villages and more than 95 per cent of the households in the tea gardens use firewood for cooking. Common people's access to mass media and leisure is an important indicator of standard of living. We see that 36.5 per cent of the houses in forest villages and 27.5 per cent in tea garden areas have television. However, a small fraction of households (6-8 %) reads newspaper.

Forest villagers enjoy the privilege of cultivating a plot of forest land and size of such holdings varies from less than one acre to more than three acres. The average size of holding is 1.11 acres in forest villages and 1.78 acres in the district.

Table 8 shows indicators of education (measured by years of schooling for population aged 15 and above) and access to food (considering whether the households have taken milk/curd or meat/chicken/fish or pulses at least once a week). The table shows that although tea-plantation workers are more educated than forest villagers, they are significantly deprived in terms of access to food. This phenomenon supports the recent hue and cry in the region on hunger and malnutrition. Further, we found that out of population aged 18 and above, 41.6 per cent in tea gardens and 53.2 per cent in forest villages are illiterate. Among children in the age group of 6-14, 1.6 per cent in tea-gardens and 35.1 per cent in the forest villages have no education. In addition to Forest Department's own employment guarantee scheme, on an average, forest villagers got 25 days of work in one year under the national one (NREGA). Such data on tea gardens are inadequate.



The basic objective of this study is to evaluate well-being conditions of the forest villagers and tea-plantation workers from capability perspective. In its simplest form, Capability Approach is a framework for the evaluation of individual welfare in terms of their functionings and capabilities, which are defined as an individual's actual and potential activities and states of being respectively ¹¹. Thanks to this approach, when we conceptualise welfare as standard of living, our focus of attention shifts from merely income to a wide range of indicators in different dimensions of life, such as knowledge and education, health and nutrition, housing, and others ¹².

Illustrations (from top): (i) living conditions in a tea garden (ii) happy living in a trodden hut in a forest village.



Table 7. Living conditions in the forest villages and plantation area

Amenities/ Resources	Category	Jalpaiguri District*		Forest Villages		Tea gardens	
		n	%	n	%	n	%
Housing	Kuccha [□]	58	19.9	70	35	137	68.5
	Semi-pucca [*]	120	41.1	68	34	61	30.5
	Pucca ^ψ	114	39.0	0	0	2	1.0
	Wooden	0	0	62	31	0	0
Toilet	Own	137	46.9	107	53.5	172	86.0
	Shared	36	12.3	12	6.0	13	6.5
	No toilet	119	40.8	81	40.5	15	7.5
Water	Tap	67	23	0	0	199	99.5
	Tube well	114	39	128	64	0	0
	Well	101	34.6	16	8	0	0
	Other	10	3.4	56	28	1	0.5
Electricity	Yes	167	57.2	148	74	115	57.5
	No	125	42.8	52	26	85	42.5
Fuel for cooking	Firewood	160	54.8	197	98.5	191	95.5
	LP Gas	132	45.2	3	1.5	9	4.5
Television	Yes	144	49.3	73	36.5	55	27.5
	No	148	50.7	127	63.5	145	72.5
Newspaper (weekly)	Yes	-	-	12	6	16	8
	No	-	-	188	94	184	92
Size of holding [▲]	< 1 acre	34	35.8	131	65.5	-	-
	1-2 acre	29	30.5	47	23.5	-	-
	2-3 acre	18	19	15	7.5	-	-
	> 3 acre	14	14.7	7	3.5	-	-
Total for each category		292	100	200	100	200	100

* Rural area & according to DLHS-3, [□] Kuccha: Muddy structure/plinth area, ^{*} Concrete plinth areas only, ^ψ Concrete structures; [▲] Average size of holding: 1.11 acre in forest villages and 1.78 acre in the district.

Table 8. Indicators of education and access to food

Background	Forest villages		Tea-plantation area	
	E (n)	F (n)	E (n)	F (n)
<i>Gender</i>				
Female	3.0 (360)	0.64 (14)	4.0 (396)	0.51 (55)
Male	4.0 (384)	0.78 (186)	5.7 (379)	0.45 (145)
<i>Religion</i>				
Buddhist		-	5.1 (189)	0.58 (48)
Christian	4.0 (329)	0.80 (90)	3.6 (107)	0.07 (30)
Hindu	3.2 (415)	0.75 (110)	5.0 (469)	0.51 (120)
Muslim			5.2 (10)	1.00 (2)
<i>Caste</i>				
General	3.9 (15)	1.00 (4)	7.4 (73)	0.50 (16)
OBC			6.9 (24)	0.88 (8)
SC	1.9 (12)	1.00 (4)	5.5 (31)	1.00 (8)
ST	3.6 (717)	0.76 (192)	4.5 (647)	0.41 (168)
<i>Ethnicity</i>				
Rava, etc.	3.6 (465)	0.81 (120)	-	-
Adivasi	3.4 (279)	0.71 (80)	-	-
All	3.5 (744)	0.77 (200)	4.8 (775)	0.47 (200)

E: Index of education – average years of schooling (individual level), F: Index of access to food – mean value of 1 (foodstuff taken once a week) and 0 (otherwise) (household level), n: number of persons or households (as applicable). In Jalpaiguri population aged 20 and above have 6.59 years of schooling on an average according to DLHS-3.



Capability represents a set of vectors of beings and doings, reflecting a person's freedom to lead one type of life or another. It emphasises on individual advantage that a person has, that is, the substantive freedoms she or he enjoys to lead the kind of life she or he has reason to value. The capability thus reflects the alternative combinations of functioning that a person can achieve, and from which he or she can choose one collection¹³.¹⁴ With this precept of the approach, we study empirically¹⁵ living conditions of the people of this region, their livelihood activities and available alternatives, health status, and choice of health care with which they may lead a meaningful living.

Illustrations (from top): (i) a simple kitchen in a forest village; (ii) a simple dining in a forest village.



5. Morbidity

Health is defined by the World Health Organisation as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity¹⁶. The term morbidity, meaning the state of illness or disability in a population, is a departure from the above-mentioned ideal health condition. Though death is clearly a well-defined event, illness is not. But it is a state somewhere between perfect health and death whose identification depends upon both the criteria used and type of observation applied to them. Morbidity measures are of two types: self-perceived morbidity and observed morbidity^{17, 18, 19}. The objective and scope of the study require a measure of the first type.

Self-perceived morbidity refers to measures, which are perceived and reported by an individual, usually in response to enquiries regarding illness. They may be grouped into four categories: symptoms and impairments, functional disability, handicap, and health service use¹⁸. Functional disability includes persons who are unable to perform some economic activities. When information on the first three are not available, researchers try to guess morbidity from records on health services utilisation. In the present study, we have collected information on all.

Table 9. Four forms of morbidity: 2012-2013

Area	Forms of morbidity	Frequency	
		n	%
Forest villages (N=1037)	Perception and reporting of symptoms and impairments	290	28.0
	Functional disability	21	2
	Handicap	20	1.9
	Utilisation of health services	278	26.8
Tea-plantation area (N=961)	Perception and reporting of symptoms and impairments	210	21.9
	Functional disability	33	3.4
	Handicap	12	1.2
	Utilisation of health services	189	19.7

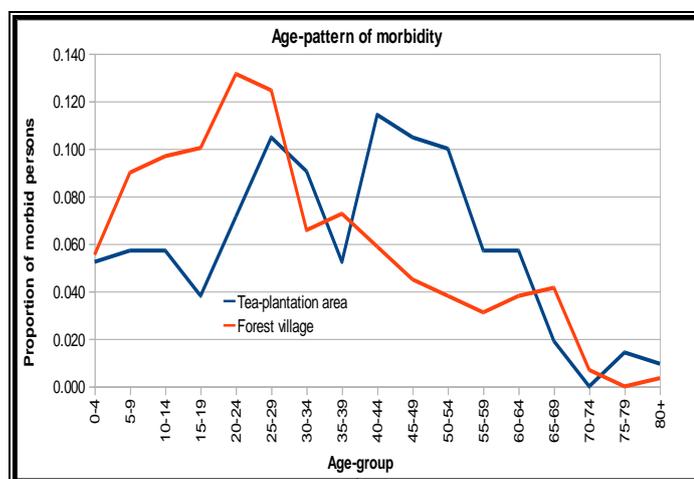


Figure 13. Age-pattern of morbidity: unlike usual U- or J-shaped pattern it shows major illness during the working phase of life



Morbidity statistics is becoming increasingly important among researchers across the globe, as it may complement mortality statistics. We know that with many other countries in India too, mortality rate has come down almost to its lowest minimum. Now it is changing very slowly. So, use of such statistics in development indicators (such as life expectancy at birth in Human Development Index) makes it quite inert and lethargic. Morbidity statistics has many dimensions and it may be of great use in studies of human well-being and development. However, news of scattered and untimely death from the closed tea gardens of the region is not too uncommon.

Illustrations (from top): (i) reporting morbidity with identity in a forest village; (ii) victim of elephant attack in a forest village.



Table 10. Incidence and prevalence rates of disease: 2012-2013

Area	Category	Incidence Rate*	Prevalence Rate*
Forest villages	Female	392.6	423.3
	Male	231.8	306.6
	All	307.6	361.6
Tea-gardens	Female	245.8	281.8
	Male	182.0	208.6
	All	213.3	244.5

* Per 1000 population per annum

Table 9 shows four forms of morbidity in forest villages and tea gardens. The first category represents perception and reporting of symptoms and impairments. We see that 290 persons out of 1037 persons (28 %) suffered from any kind of illness within the one-year reference period from the date of survey. The same percentage figure for the tea-plantation areas is 21.9. Comparatively, forest villagers are more morbid than the residents of the tea-plantation areas. Nearly two per cent of the forest villagers are physically challenged and almost a similar percentage of people reported their inability to carryout economic activities. While the percentage of functionally disabled persons in tea-plantation areas is quite high (3.4 %), the same of physically challenged ones is comparatively low (1.2 %).

Table 10 shows incidence and prevalence rates of disease²⁰ in the region during 2012-2013. While table 9 shows purely rates of sufferings, figures in table 10 are ratios in true sense of the term, as those are actually number of illness episodes per 1000 persons per annum. However, incidence rate shows the extent of new occurrence of disease within the reference period. Prevalence rate, on the other hand, shows old continuing and new occurrences of disease during the reference period.

Visibly, both the incident and prevalence rates of disease are considerably higher in the forest villages than in the tea-gardens. Such rates vary sharply according to gender. For example, in the forest villages, incidence rate for female population is 392.6. It tells that every 1000 females face nearly 393 new attacks annually. It can be converted into a monthly figure and it comes close to 33. On the other hand the annual incidence rate of 231.8 for male population gives a monthly figure, which is slightly more than 19.

If we classify the information of table 10 according to types of disease, etc. as per Operations Manual 2009 of Global Burden of Disease (GBD) Study, we have table 11 showing burden of disease, disability and injuries in three broad groups^{21, 22}. While GBD study is to enrich causes of death statistics, we adopt this strategy towards morbidity. Table 11 shows distribution of illness episodes according to three broad groups. We see that concentration of disease is the highest in the first group (nearly 49-51 %) followed by the second (46 % approx.) and then the third (nearly 2-5 %). Such a classification is important as researchers try to relate it with stages of economic development. Table 12 is self-explanatory and distinctive reflecting the profile of disease, disability and injuries of the region in detail.



It has been postulated that in progressing from high to low mortality levels, all population experience a shift in the major causes of illness and disease. Whereas infectious diseases and nutritional and reproductive health problems predominate in high mortality populations, chronic and degenerative diseases predominate in low mortality populations. Injuries tend to vary according to contexts^{17, 23}. This is how epidemiological profile is related to various stages of economic development. Results show that forest villages and tea-gardens have similar epidemiological profile and have double burden of infectious as well as chronic and degenerative diseases.

Illustrations (from top): (i) waiting for the interview in a tea garden; (ii) meeting outsides with morbidity and disability in a forest village.



Table 11. Burden of disease, disability and injuries in three broad groups

Cause Group	Major Categories	Forest villages		Tea-plantation areas	
		n	%	n	%
Group I: Communicable, maternal, perinatal and nutritional conditions	Infectious and parasitic diseases, Respiratory infections, Maternal conditions, Perinatal conditions, Nutritional deficiencies	192	51.2	116	49.3
Group II: Non-communicable diseases	Malignant neoplasms, Other neoplasms, Diabetes mellitus, Endocrine disorders, Mental and behavioural disorders, Neurological conditions, Sense organ disorders, Cardiovascular and circulatory diseases, Respiratory diseases, Digestive diseases, Diseases of the genitourinary system, Skin diseases, Musculoskeletal diseases, Congenital abnormalities, Oral diseases	174	46.4	108	46.0
Group III: Injuries	Unintentional injuries, Intentional injuries	9	2.4	11	4.7
All	-	375	100	235	100



Illustration (top): (i) livelihood activities in a forest village; Illustrations (from left) (ii) a formal market place inside Chilapata forest, (iii) an informal market place of home-made liquor in a forest village, (iv) a leisure spot near Bania forest village – where Moner Manush, a 2010 Bengali feature film was shot, (v) a busy day in a tea garden.



Table 12. Burden of disease, disability and injuries in the forest villages and tea-plantation areas in detail

GBD Code	GBD categories	Illness/Symptoms reported during survey	Forest villages		Tea-plantation area	
			n	%	n	%
IA	Tuberculosis	Tuberculosis	22	5.87	10	4.26
IB	HIV/AIDS	-	0	0.00	0	0.00
IC	STDs excluding HIV	-	0	0.00	0	0.00
ID	Intestinal infectious diseases	Diarrhoea	5	1.34	3	1.28
IE	Selected vaccine preventable childhood diseases	Polio*	1	0.27	1	0.43
IF	Meningitis and encephalitis	Chickengunia	0	0.0	40	17.02
		Pneumonia	1	0.27	0	0.00
IG	Hepatitis	Hepatitis	1	0.27	1	0.43
		Jaundice	1	0.27	1	0.43
IH	Malaria	Malaria*	37	9.87	2	0.85
Ii	Parasitic and vector diseases	-	0	0.00	0	0.00
IJ	Other infectious diseases	Urinary Tract Infection	1	0.27	0	0.00
IK	Respiratory infections [Addition: Pain in throat, Chest pain – unspecified, Cough, Fever – unspecified/ unknown origin]▲	Cough	9	2.40	0	0.00
		Fever*	61	16.27	43	18.30
		Pain in chest	4	1.07	4	1.70
		Pain in throat	5	1.33	1	0.43
		Tonsillitis	1	0.27	0	0.00
IL	Maternal conditions	Delivery ^v	26	6.93	6	2.55
IM	Neonatal conditions	Weakness*	1	0.27	0	0.00
IN	Nutritional deficiencies [Addition: Extreme poverty]▲	Anaemia	7	1.87	0	0.00
		Calcium deficiency	0	0.0	1	0.43
		Hunger	1	0.27	0	0.00
		Tumour in throat	3	0.80	0	0.00
		Vitamin deficiency	0	0.0	1	0.43
		Weakness	5	1.33	2	0.85
IIA	Malignant neoplasms	-	0	0.00	0	0.00
IIB	Other neoplasms	Tumour in abdomen	2	0.53	3	1.28
		Tumour in breast	0	0.0	1	0.43
		Tumour in forehead	1	0.27	0	0.00



Illustrations (from top): (i) She has this house and 10 kg of rice per month as old-age benefit in a forest village; (ii) living with hope in a tea garden, which opened after several years of closure.



IIC	Diabetes mellitus	Diabetes	1	0.27	3	1.28
IID	Endocrine, nutritional, blood and immune disorders	Thalassemias	0	0.00	1	0.43
IIE	Mental and behavioural disorders	Autistic	0	0.0	1	0.43
		Mentally challenged	3	0.80	1	0.43
		Stammering	2	0.53	1	0.43
		Epilepsy	3	0.80	1	0.43
IIF	Neurological conditions	Headache	8	2.13	1	0.43
		Old-age problem	0	0.0	1	0.43
		Paralysis	1	0.27	5	2.13
		Problem with nerve	3	0.80	0	0.00
		Sleeping disorder	0	0.0	1	0.43
		Blindness	1	0.27	2	0.85
IIG	Sense organ diseases	Blood-spot in eye	1	0.27	0	0.00
		Deaf and Dumb	4	1.07	1	0.43
		Hearing impaired	3	0.80	5	2.13
		Low eyesight	3	0.80	0	0.00
		Partial Blindness	1	0.27	1	0.43
		Problem with eye	8	2.13	5	2.13
		Heart attack	1	0.27	0	0.00
		Hypertension	7	1.87	14	5.96
IIH	Cardiovascular and circulatory diseases	Hypotension	7	1.87	6	2.55
		Pain in heart	2	0.53	0	0.00
		Piles	1	0.27	0	0.00
		Problem in heart	1	0.27	6	2.55
		Stroke	1	0.27	0	0.00
		Asthma	1	0.27	0	0.00
		Breathing problem	1	0.27	3	1.28
IIJ	Digestive diseases [Addition: Intra-abdominal and pelvic swelling, mass and lump] [▲]	Gall stone	0	0.0	1	0.43
		Gastric problems	16	4.27	6	2.55
		Indigestion	1	0.27	0	0.00
		Pain in abdomen	11	2.93	7	2.98
		Problem in stomach	2	0.53	2	0.85
		Problem with liver	2	0.53	3	1.28



Illustrations (top): (i) what is invisible in the forest villages is TB - every ninth family has one such patient on an average; (ii) a snap from a tea-plantation area - may all we wish a better future for them.



		Swollen abdomen*	4	1.07	0	0.00		
		Ulcer	1	0.27	1	0.43		
IIK	Genitourinary diseases	Gynaecological problem	1	0.27	0	0.00		
		Kidney stone	0	0.0	5	2.13		
		Problem with Kidney	2	0.53	0	0.00		
IIL	Skin diseases	Allergy	2	0.53	0	0.00		
		Skin disease	5	1.33	3	1.28		
IIM	Musculoskeletal diseases	Arthritis	9	2.40	0	0.00		
		Body ache	8	2.13	5	2.13		
		Low back pain	13	3.47	0	0.00		
		Orthopaedic	0	0.0	1	0.43		
		Pain in hand	1	0.27	0	0.00		
		Pain in joints/knee	4	1.07	5	2.13		
		Pain in leg	5	1.33	4	1.70		
		Pain in neck	2	0.53	0	0.00		
		Physically handicapped	10	2.67	2	0.85		
		Problem in leg	1	0.27	0	0.00		
		Weakness (limbs, muscle)	4	1.07	0	0.00		
		IIN	Congenital anomalies	-	0	0.00	0	0.00
		IIO	Oral conditions	Problem in teeth	3	0.80	0	0.00
		IIIA	Unintentional injuries	Bison attack	1	0.27	0	0.00
Bone fracture (lower leg)	2			0.53	5	2.13		
Dog bite	1			0.27	0	0.00		
Fell down from hill	1			0.27	0	0.00		
Injury in right hand	1			0.27	0	0.00		
Motor / Bike accident	2			0.53	5*	2.13		
Wound in leg	1			0.27	0	0.00		
Wound in thumb	0			0.0	1	0.43		
IIIB	Intentional injuries			-	0	0.00	0	0.00
All	-			-	375	100	235	100



Illustrations (top): (i) a snap from a forest village – feeling happy with her stock for the coming rainy season; (ii) simple but a rich kitchen in a tea garden.



Group I: Communicable, maternal, perinatal and nutritional conditions; Group II: Non-communicable diseases; Group III: Injuries; *One case has been fatal (totalling five). [‡] Currently the patient is aged 37. [‡] 12 & 4 cases are of home delivery in forest villages (46.15 % of total delivery), and tea-plantation areas (66.66 % of total delivery) respectively. [▲] These are added according to local conditions, as they are seen to cause morbidity.

6. Health seeking behaviour

Health seeking behaviour is shaped by a number of factors, which may include characteristics of the (i) disorder and their perception (type, stage and intensity of illness, number of spells, duration of illness episode, and identification of the disease), (ii) subject [family characteristics (age, gender, household size, marital status), social structure (education, employment, ethnicity, religion), culture; affordability of a household (land, livestock, cash income)], and (iii) service (availability of and accessibility to health care, opinion and attitudes towards traditional and modern healers, quality and cost of care, etc.). A complex but systematic interaction of these factors with perceived morbidity (as shown in figure 14) determines utilisation of a care²⁴.

Table 13. Utilisation of health care according to type of care

Area/Range	Public		Private		Self-treatment, etc.		Total N	
	n	%	n	%	n	%		
Forest village	Chilapata	37	29.4	55	43.7	34	27.0	126
	Jaldapara South	7	30.4	3	13.0	13	56.5	23
	Kodalbasti	37	37.4	27	27.3	35	35.4	99
	Lankapara	36	66.7	8	14.8	10	18.5	54
	Madarihat	33	45.2	11	15.1	29	39.7	73
	All	150	40.0	104	27.7	121	32.3	375
Tea-plantation area	Buxa	11	61.1	5	27.8	2	11.1	18
	Central Dooars	48	64.0	20	26.7	7	9.3	75
	Gangutia	13	32.5	19	47.5	8	20.0	40
	Kalchini	10	14.1	45	63.4	16	22.5	71
	Raimatang	2	6.5	27	87.1	2	6.5	31
	All	84	35.7	116	49.4	35	14.9	235

Table 14. Utilisation of health care according to system of medicine

Area/Range	Modern*		Traditional		Total N	
	n	%	n	%		
Forest village	Chilapata	83	63.5	43	34.1	126
	Jaldapara South	10	43.5	13	56.5	23
	Kodalbasti	59	59.6	40	40.4	99
	Lankapara	36	66.7	18	33.3	54
	Madarihat	34	46.6	39	53.4	73
	Total	222	58.4	153	40.8	375
Tea-plantation	Buxa	16	88.9	2	11.1	18
	Central Dooars	68	89.3	7	9.3	75
	Gangutia	32	77.5	8	20.0	40
	Kalchini	56	78.9	15	21.1	71
	Raimatang	20	64.5	11	35.5	31
	All	192	80.9	43	18.3	235

* Mostly Allopathy with few cases of Homeopathy



India has a rich, centuries-old heritage of medical and health sciences. However, over the centuries, with the intrusion of foreign influences and mingling of cultures, various systems of medicine evolved and have continued to be practiced widely. The allopathic system of medicine gained popularity under the British rule and made a major impact on the entire approach to health care in the country after independence. At present with the mainstream system of Allopathy five other alternative systems of medicine such as Ayurveda, Homoeopathy, Naturopathy and Yoga, Siddha, and Unani, are practiced officially²⁵.

Illustrations (top): (i) way to Dhumchi forest village - far from the madding crowd; (ii) one of the three dry rivers (in winter) - on the way to tea garden in Rangamati.



Tables 13 and 14 show utilisation of health care according to type of care (public, private, self-treatment, etc.) and system of medicine. Although there are six official systems of medicine, we found instances of using mostly Allopathy with few cases of Homeopathy. However, utilisation rate of public health facility is higher in the forest villages (40 %) than in the tea gardens (35.7 %). On the contrary, utilisation of private health care is higher in the tea gardens (49.4 %) than in the forest villages (27.7 %). For a considerable percentage of cases, forest villagers rely on self-treatment or else (unrecognised ones). When we classify health seeking behaviour according to systems of medicine, we see that for majority of the cases, people in tea gardens rely on modern care (80.9 %). Utilisation of modern care in the forest villages is found low (46.6 %) in contrast to traditional and unrecognised ones.

Utilisation of health care may be considered as a random event. Although it is governed by patients' perspectives and conceptions about illness and medicine²⁶, it has fare degree of predictability with respect to the characteristics listed above. In order to sketch health seeking behaviour we estimate binary-multivariate and multinomial regression models²⁷ as shown in tables 15 and 16 (elaborated in the section of technical notes below). First, we examine likelihood of utilising modern care in contrast to traditional ones (table 15). We see that (when other things are held constant) likelihood of utilising modern care is more than three times higher in tea gardens than in forest villages. We also see that probability of utilising modern care is exorbitantly high in the forest villages and in the Dooars region in case of communicable and infectious diseases and for conditions under Group I of the Global Burden of Disease (GBD) Study. Among other variables, impact of two disease characteristics found statistically significant. Severity of illness is measured in three categories: high (1), medium (2), and low (3). As severity decreases, likelihood of utilising modern care decreases sharply. When duration of illness episode increases, probability of using modern care decreases.

Finally, we examine likelihood of using public and private care in contrast to self-treatment, etc. by estimating a multinomial logit regression model²⁷ considering the characteristics of the disorder and type of locality only. In the first panel of table 16, we see that likelihood of utilisation of public care is significantly higher when (i) severity is high, (ii) duration of illness episode is short, and (iii) diseases and conditions belong to GBD Cause Group I.

In the second panel, we see that likelihood of utilisation of private care is high when duration of illness episode is short. In contrast to self-treatment, etc., likelihoods of utilisation of public care (in the first panel) and that of private care (in the second panel) are higher in tea gardens. However, the relationship is significantly stronger in case of private care than that of public one.



Community bathrooms and toilets and those in household premises are commonly visible in the forest villages. However, at times those are found as abandoned. This is probably a cultural phenomenon or a matter of choice or tests and preferences. At times superstitions work. I was told about this possibility in a forest village. Some people think that if they always keep themselves clean, some supernatural forces may choose them first to take away from this beautiful Earth. Similarly, some forest villagers own milch cow, but they never drink milk. Consumption of milk may make them cute and it may draw attention of the tigers.

Illustrations (top): (i) publicly provided community bathroom in a forest village; (ii) an abandoned toilet (publicly provided) in a beautiful environment in a forest village.



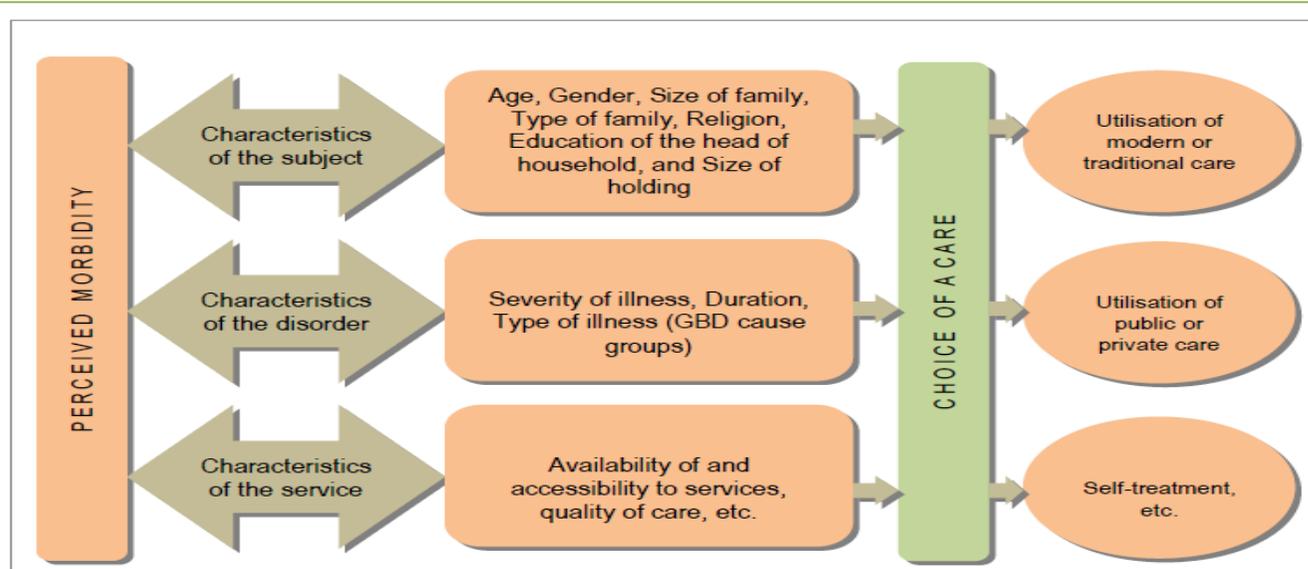


Figure 14. Conceptual framework to examine health seeking behaviour



Illustration (top): (i) livelihood activities in a forest village; Illustrations (from left) (ii) livelihood activities in a forest village, (iii) a lazy noon at Titi forest village, (iv) busy morning in a forest village at Buxa, (v) bird's eye view of the main business centre of Dooars – the twin city – Joigaon (India) and Phuntsholing (Bhutan).



Table 15. Parameter estimates of binary multivariate logit model: Odds ratios of utilising modern care

Predictor variables	Forest village	Tea garden	Dooars village
Age	1.019 ²	1.000	1.007
Gender (rc: female)			
Male	0.738	1.549	0.926
Size of family	0.772	1.325	0.774
Type of family (rc: joint)			
Nuclear	1.322	0.326 ²	0.904
Religion (rc: Other)			
Hindu	1.256	0.685	1.010
Education of household head	0.899	0.868	0.868
Size of holding	1.093	-	-
Severity of illness	0.345 ¹	0.609	0.425 ¹
Duration of illness episode	0.222 ¹	0.901	0.367 ¹
GBD groups (rc: Group III)			
Group I	12.620 ¹	2.154	4.733 ¹
Group II	3.314	1.159	1.903
Area (rc: Forest villages)			
Tea-plantation area	-	-	3.220 ¹
Constant	0.681	7.640 ²	5.546 ¹
Nagelkerke R Square	0.434	0.119	0.334

rc: reference category; ¹p<0.01, ²p<0.05, ³p<0.10

Table 16. Parameter estimates of multinomial logit model: Odds ratios of utilising public and private care

Type of care	Predictor variables	Exp (B)
Public care: 1 (rc: Self-treatment, etc.: 3)	[Severity = 1, high]	5.025 ¹
	[Severity = 2, medium]	1.640
	[Severity = 3, low]	-
	[Duration = 1, ≤ 30 days]	3.083 ¹
	[Duration = 2, > 30 days]	-
	[GBD cause group = I]	2.982 ¹
	[GBD cause group = II]	0.976
	[GBD cause group = III]	-
Private care: 2 (rc: Self-treatment, etc.: 3)	[Tea-plantation area = 1]	1.687 ²
	[Forest villages = 2]	-
	[Severity = 1, high]	1.676
	[Severity = 2, medium]	1.457
	[Severity = 3, low]	-
	[Duration = 1, ≤ 30 days]	3.727 ¹
	[Duration = 2, > 30 days]	-
	[GBD cause group = I]	1.164
[GBD cause group = II]	1.387	
[GBD cause group = III]	-	
[Tea-plantation area = 1]	3.915 ¹	
[Forest villages = 2]	-	
Nagelkerke R Square		0.302

a The reference category (rc) is: 3. ¹p<0.01, ²p<0.05, ³p<0.10.



The public health care delivery system in India at present has a three-tier structure: primary, secondary, and tertiary. The primary tier has been developed to provide health care services to the vast majority of rural people. It comprises three types of health care institutions: Sub-Centre (SC), Primary Health Centre (PHC) and Community Health Centre (CHC). SC is the first contact point between health workers and village community and it is supposed to cater the need of 5000 population in plain area and 3000 in hilly / tribal area, The remaining two cater the need of 20000 - 120000 population according to type of locality ²⁸. Although in some way or other tea gardens have their own health facilities, provision of health care is almost invisible within the proximity of the forest villages.

Illustrations (from top): (i) returning home from work in a tea garden, (ii) returning home after fishing in a forest village.



7. Conclusion

Forest villages of Dooars in North Bengal (West Bengal, India) are public estates created inside or near the forest area during the latter half of the 19th century under the British rule conscripting local and migrated tribal people into a bonded labour relationship for forestry works without rights to property. Tea gardens in Dooars also started appearing similarly almost during the same period on fallow lands in forest clusters as private estates to promote export of tea from this region. While the need for such labourers declined and decentralisation in governance is on, the problem of transferring property rights becomes a major debatable issue in the region. With this, the recession of the economy in recent past has added another dimension to the problem and which has been the main motivation for me to undertake this minor research project. We understand that lives in the forest villages largely depend on forest (and Department of Forests) and are less affected by market forces. On the contrary, lives dependent on the tea industry are likely to be affected directly from the market forces. This has happened as industry was adversely affected and news of misery in the form of hunger and malnutrition or even scattered death has been shocking us through useful media coverage or else for several years. The extent of hardship drew attention of the State and Central Governments too leading to various special poverty alleviation programmes. In such a situation, although exploratory, I tried to investigate scientifically quality of life related issues in these two types of typical residential setups, especially about how the forest villagers and tea-plantation workers are provided with the basic capabilities to participate in and to contribute to society considering living conditions, health and well-being related issues. And with this I tried too to understand their surroundings and their close and immediate interactions with the environment.

Although summary findings are presented in the first section, I would like to emphasise the following. Living conditions in both the forest villages and tea-gardens may be improved further through improvement of housing structures. Provision of housing amenities and sanitation are found satisfactory. Provision of LP Gas for cooking may lead to more eco-friendly living. The programme of universalisation of education needs to be boosted up, as a considerable proportion of children in the forest villages are seen to have no education. Access to food is significantly poor in tea-plantation areas than in the forest villages. With this a gender ratio (ratio of males to females) of 0.96 in tea-plantation areas draws our attention. It is worth mentioning that in the forest villages, the national rural employment guarantee scheme (NREGA) runs parallel with a similar one of the Forest Department. Such data on tea gardens are inadequate. The issues of health and health care should be addressed as per the findings (on burden of disease, disability and injuries, and preference for health care) of this study. Primary livelihood activities in the forest villages are affected by man-animal conflicts. And not all the alternative livelihood activities are found as desirable. May the inhabitants be capable enough with true freedom to lead a kind of living that we all find reasons to value it!



It is not always possible to document everything in the same language. Sometimes it is easy to write something than illustrating. Sometimes ... the opposite. I tried to document the way of living of some special groups of people living inside or near forests and present it in appropriate forms ... in writings and in illustrations. Also it was not possible to cover all relevant aspects and the whole Dooars. I have exercised the maximum possible freedom in investigation within the scope of a UGC *minor* research project. I hope to substantiate this study if I undertake a *major* one.

Illustrations (from top): (i) it is teatime in a tea garden after the survey at evening; (ii) this cute kid did not listen to its master and blocked the road to greet us – on the way through Chilapata forest!



8. Technical notes

Binary multivariate logistic regression model:

The standard form of an estimated logistic function is:

$$P = \frac{1}{1 + e^{-Z}}, \quad (i)$$

where Z is the predictor variable, e is the base of the natural logarithm, and P is the estimated probability of occurrence of one point of the dependent variable²⁷. From equation (i) it follows that:

$$1 - P = 1 - \frac{1}{1 + e^{-Z}} = \frac{e^{-Z}}{1 + e^{-Z}}. \quad (ii)$$

Dividing (i) by (ii) we get

$$\frac{P}{1 - P} = e^Z. \quad (iii)$$

Or,

$$\Omega = \exp(Z) \quad (iv)$$

where Ω (uppercase omega) $\equiv \frac{P}{1 - P}$ (is called the odds).

Now, if we assume that Z , instead of being a single predictor variable, is linear function of a set of predictor variables:

$$Z \equiv \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k, \quad (v)$$

substituting (v) in (iv) we get:

$$\Omega = \exp(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k). \quad (vi)$$

In table 15, our dependent variable is probability of utilising modern care in contrast to that of traditional ones. We assign the dependent variable 1 if the event occurs, 0 otherwise. The set of predictor variables are denoted by X_i ($i = 1, 2, \dots, k$).

Multinomial logistic regression model:

As we are interested to focus on likelihoods of utilising public care and private care in contrast to self-treatment, etc., we estimate multinomial logit model. If P_1, P_2, P_3 be the estimated probabilities of utilising public care, private care and self-treatment respectively, the multinomial logit model then consists of two equations plus a constraint²⁷:

$$\log \frac{P_1}{P_3} = \alpha_1 + \beta_{11} X_{11} + \beta_{12} X_{12} + \dots + \beta_{1k} X_{1k}. \quad (vii)$$

$$\log \frac{P_2}{P_3} = \alpha_2 + \beta_{21} X_{21} + \beta_{22} X_{22} + \dots + \beta_{2k} X_{2k}. \quad (viii)$$

$$P_1 + P_2 + P_3 = 1. \quad (ix)$$

The categories of the response variable are mutually exclusive and exhaustive. A sample member must fall in one and only one of the categories.

Estimated results of multinomial logistic regression model (odds ratios) are shown in table 16. The first panel shows results associated with equation (vii) and the second panel shows those associated with equation (viii).

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