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State of Health in the Ganga River Basin

GRBMP: Ganga River Basin Management Plan

by

Indian Institutes of Technology

IIT Bombay | IIT Delhi | IIT Guwahati | IIT Kanpur | IIT Kharagpur | IIT Madras | IIT Roorkee

Preface

In exercise of the powers conferred by sub-sections (1) and (3) of Section 3 of the Environment (Protection) Act, 1986 (29 of 1986), the Central Government has constituted National Ganga River Basin Authority (NGRBA) as a planning, financing, monitoring and coordinating authority for strengthening the collective efforts of the Central and State Government for effective abatement of pollution and conservation of the river Ganga. One of the important functions of the NGRBA is to prepare and implement a Ganga River Basin Management Plan (GRBMP).

A Consortium of 7 Indian Institute of Technology (IIT) has been given the responsibility of preparing Ganga River Basin Management Plan (GRBMP) by the Ministry of Environment and Forests (MoEF), GOI, New Delhi. Memorandum of Agreement (MoA) has been signed between 7 IITs (Bombay, Delhi, Guwahati, Kanpur, Kharagpur, Madras and Roorkee) and MoEF for this purpose on July 6, 2010.

This report is one of the many reports prepared by IITs to describe the strategy, information, methodology, analysis and suggestions and recommendations in developing Ganga River Basin Management Plan (GRBMP). The overall Frame Work for documentation of GRB EMP and Indexing of Reports is presented on the inside cover page.

There are two aspects to the development of GRBMP. Dedicated people spent hours discussing concerns, issues and potential solutions to problems. This dedication leads to the preparation of reports that hope to articulate the outcome of the dialog in a way that is useful. Many people contributed to the preparation of this report directly or indirectly. This report is therefore truly a collective effort that reflects the cooperation of many, particularly those who are members of the IIT Team. Lists of persons who have contributed directly and those who have taken lead in preparing this report is given on the reverse side.

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1. Introduction

This report presents the status of health along with morbidity and public and private healthcare expenditure in the Ganga River Basin. Historically, Ganga River is considered as one of the most sacred rivers of India. However, with the passage of time, this sacred river has been polluted by its own people due to various factors, including spiritual one (Wickramasekera A., 2013). With a growing population and urbanization in the Ganga basin, per capita availability of water, drinking water and safe drinking water has declined significantly. The links between population growth and environmental degradation are under congestions because the ever-increasing numbers of people depend on a fixed natural resource base (Dwivedi and Pathak, 2007). Discharge of untreated sewage and industrial effluence are major causes of degradation of river water quality. The total wastewater generation from 222 towns in Ganga basin is estimated to be 8250 MLD, out of which 2538 MLD is directly discharged into the Ganga River, 4491 MLD is disposed into tributaries of river Ganga and 1220 MLD is disposed on land or low lying areas. Furthermore, Uttar Pradesh contributed more than 55% of the total urban industrial pollution load to the basin. (CPCB, "Status of Sewage Treatment Plants in Ganga Basin")

The untreated or improperly treated wastes disposed into aquatic resources from where the downstream city's water requirements are met, constitute a big public health hazard in terms of their potential for spreading water borne diseases. It may also be mentioned that the existing public healthcare infrastructure is not adequate to meet the ever increasing healthcare requirement in the basin. Most of the health expenditure is supported by private spending, primarily Out of Pocket (OOP), with public funds constituting an insufficient amount. Around 39.5 million people fell below the poverty line in India due to out-of-pocket health payments in 2004–2005. Policies to reduce poverty in India need to include measures to reduce catastrophic out-of pocket health payments (Bonu et al, 2007).

Inadequate and inefficient public healthcare infrastructure and rising health hazards owing to inadequate access to safe drinking water and sanitation put enormous monetary burden of medical and health expenditure on households, with the spread of some alarming vector diseases in this region. Huge amount of public and private expenditure on water-borne diseases could be saved if quality of water is improved through reducing the river and ground water pollution and degradation. It is in this context that this study is carried out to examine the water, sanitation and health related issues in the Ganga basin.

1.1 Rationale of the Study

Water, sanitation and health are the closely related issues. Inadequate access to safe drinking water & sanitation facilities and poor hygiene practices lead to ill-health of the people of the Ganga basin. With rising urbanization and industrialization and population pressure in the basin, the demand for water has been constantly increasing in all the sectors, including domestic one, which causes not only depletion of both surface and groundwater resources but also contaminate these resources and thereby adversely affecting human health. Untreated industrial wastes, domestic sewage, open defecation and chemicalization of agriculture pollute the water resources. Therefore, maintaining *aviral* and *nirmal* Ganga is not only desirable for the sustainability of environment and ecosystem but also for the health of people living in the basin. The health of the river is directly associated with the health of the people and the economy as well. Keeping this aspect in view, the present study attempts to examine health status of people of the basin. Although this study presents the overview of existing public healthcare infrastructure and makes detailed discussion on healthcare expenditure, the focus, however, is mainly on water-related health issues and diseases. An attempt has also been made to assess the private cost of treated drinking water, including bottled water. The findings of the study may, hopefully, provide valuable inputs for the preparation of the GRBMP.

1.2 Scope of the Study

The foremost objective of the study is to analyse the health status along with medical & health expenditure incurred by the households across the basin. With an intention that there has been an increase in water pollution in the basin, it has been inferred that medical and health expenditure of the residents had increased, especially in relation to water related diseases. This report has been divided into two major parts, one for aggregate analyses (section 4 to 6) and second for district-wise analyses (Section 7 and 8). Both the parts are further subdivided into three analytical parts. Sections 4 and 7 deal with service and education health infrastructure at aggregate and district level respectively. Sections 5 and 8 discuss issues related to drinking water, sanitation and health, particularly for Ganga basin states at aggregate and district level, respectively. Section 8 shields on health expenditure mainly for public and private expenditure at aggregate level. This section also analyse the medical treatment expenditure and loss of household's income for non-hospitalised and hospitalised treatment in the Ganga basin states. Sections 9 end with conclusions, policy implication and recommendations.

2. Data Sources and Methodology

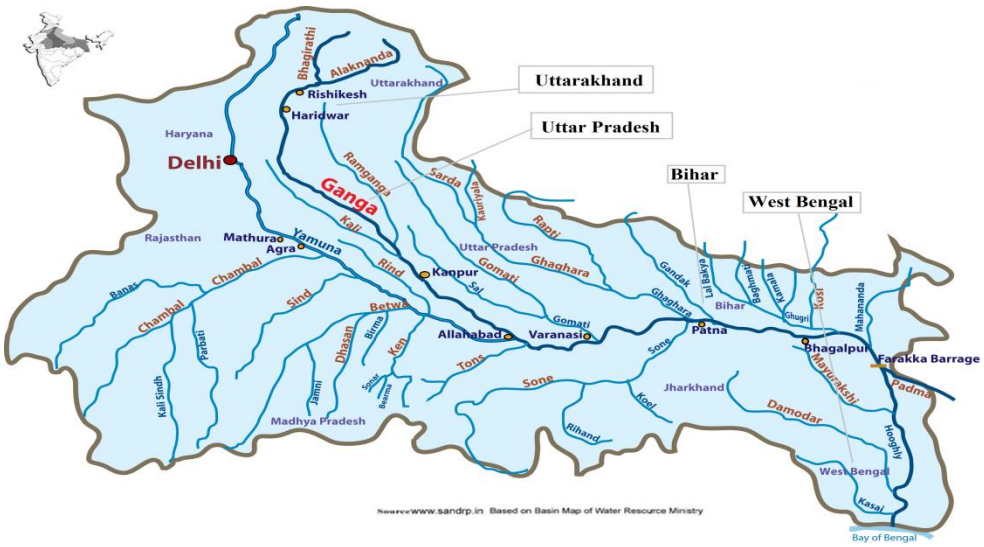
The study is based on the secondary data drawn from various published sources, such as National Health Profile (NHP), National Health Account (NHA) of India, Rural Health

Status (RHS) Bulletin, National Rural Health Mission and Census of India (2001, 2011). The data collected through the unit level records of the 60th Round of the NSSO (Report of the 60th Round on Morbidity, Healthcare and Condition of the Aged, 2004) forms the source of data to estimate household expenditures on health. This survey covered 73,868 households and 3,83,338 persons spread across all the states and union territories of India, Out of which 19,078 households (25.83% of the total surveyed households) and 1,07,635 persons (28.08% of the total surveyed persons) were surveyed in the Ganga Basin that covers Uttar Pradesh, Uttarakhand, Bihar and West Bengal. Information on utilization of healthcare services by households for hospitalized treatments by type or nature of ailment and a number of related characteristics have been collected through this survey. Also, number of households using bottled water, and treatment of water before drinking has also been collected to find out the expenditure incurred by the households on such practices. Data on medical expenditure and loss of household's income due to hospitalisation have also been collected from this particular round of NSS. Census of India has also been the important source for the distribution of population identified by major sources of drinking water, sanitation, drainage etc. For some indicators of water borne diseases, data from National Health Profile (NHP) and unit level records of 60th NSS round (2004) have been taken. Public and private expenditure on health has been taken from National Health Accounts (NHA) of India,

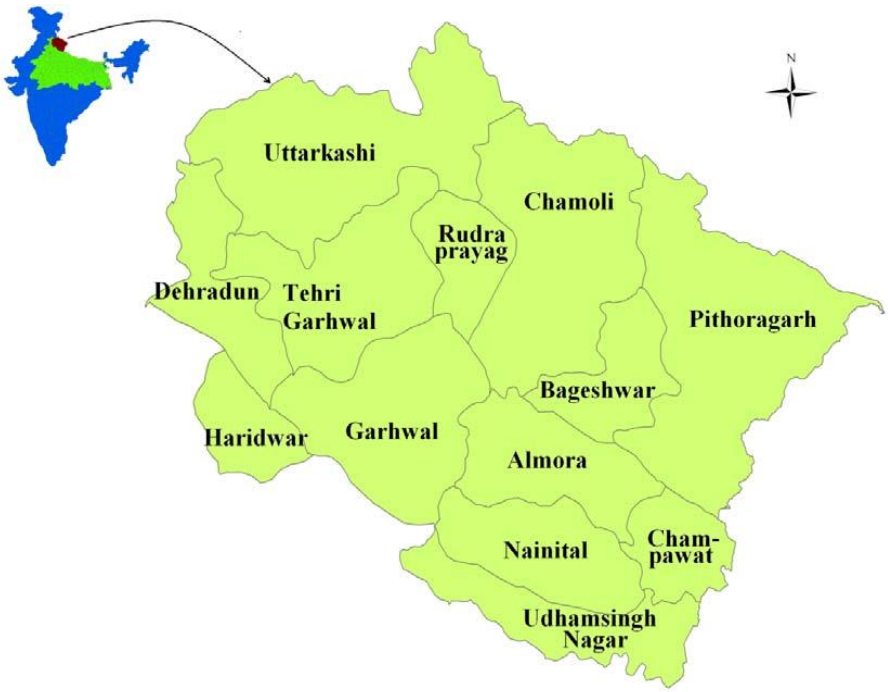
The present report considers Uttarakhand, Uttar Pradesh, Bihar and West Bengal states as part of Ganga Basin and the remaining states and UTs are considered as 'non-basin states' or 'others'. The comparison among the basin states, non-basin states and overall India has been made on various important aspects. As discuss earlier, the report is divided into two parts. First part discuses aggregate estimates of Ganga basin states and Second part deals comprehensively with the disaggregated estimates of Ganga Basin states. However, for three large states in the basin (in terms of population) such as Uttar Pradesh, Bihar and West Bengal, the disaggregated discussion is carried out in terms of groups or regions. The basis of proximity to River Ganga for Bihar and West Bengal is classified into two categories, that is., bank districts and non-bank districts and for Uttar Pradesh, into five regions.

Map-1 depicts the location of the Ganga Basin, along with its adjoining states. Map-2 illustrates the location of districts in Uttarakhand. In order to make the report more relevant, concise and brief, all the 70 districts of Uttar Pradesh have been divided into five regions and then detailed region-wise analysis has been carried out. These five regions are: Northern Upper Ganga Plains-NUGP (10 districts), Southern Upper Ganga Plains-SUGP (18 districts), Central Region-CR (9 districts), Southern Region-SR (7 districts of Bundelkhand region), and the Eastern Region-ER (26 districts). Map-3 shows the map

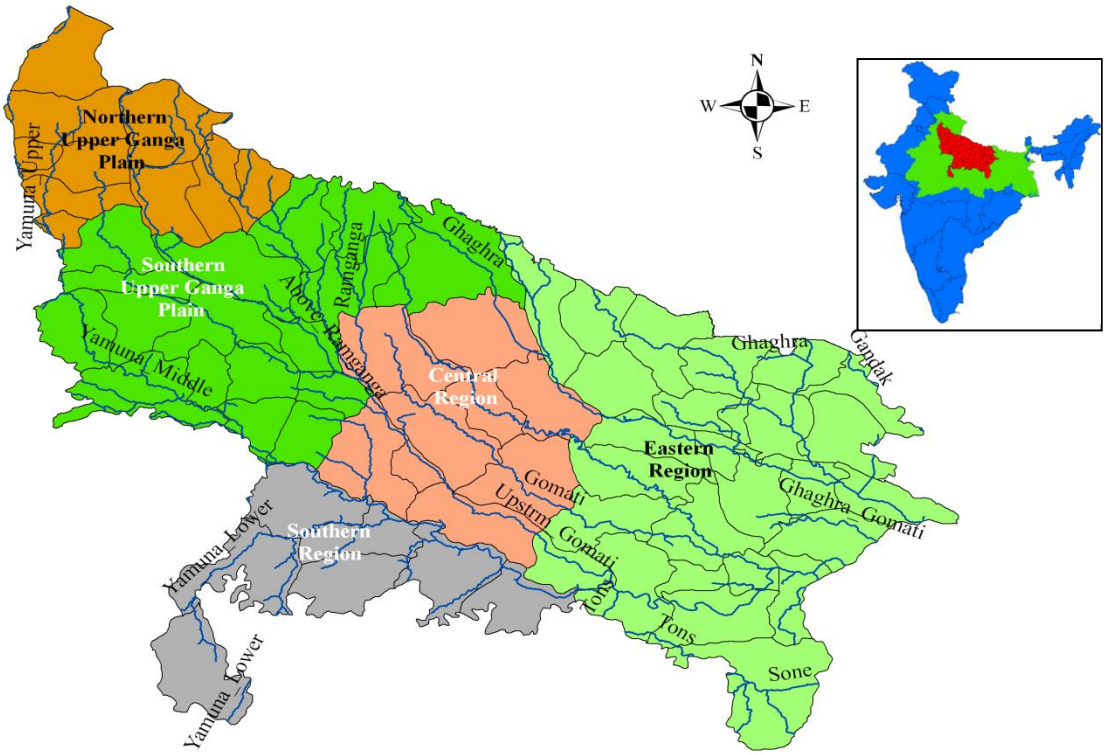
of Uttar Pradesh along with all five regions. Map 4 and 5 depicts position of bank and non- bank districts in Bihar and West Bengal, respectively.



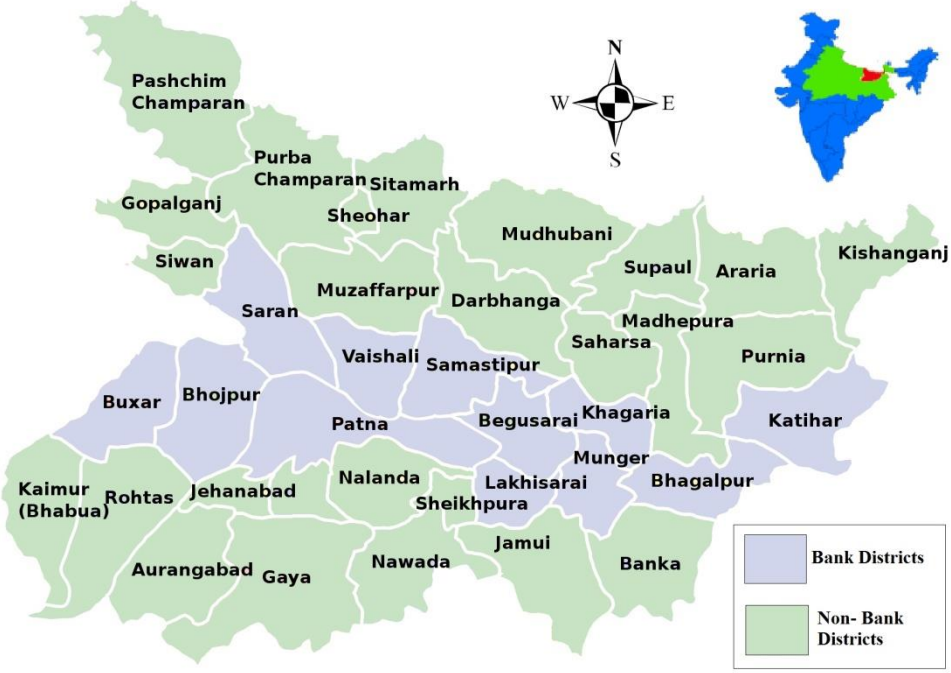
Map 1: Location of the Ganga Basin



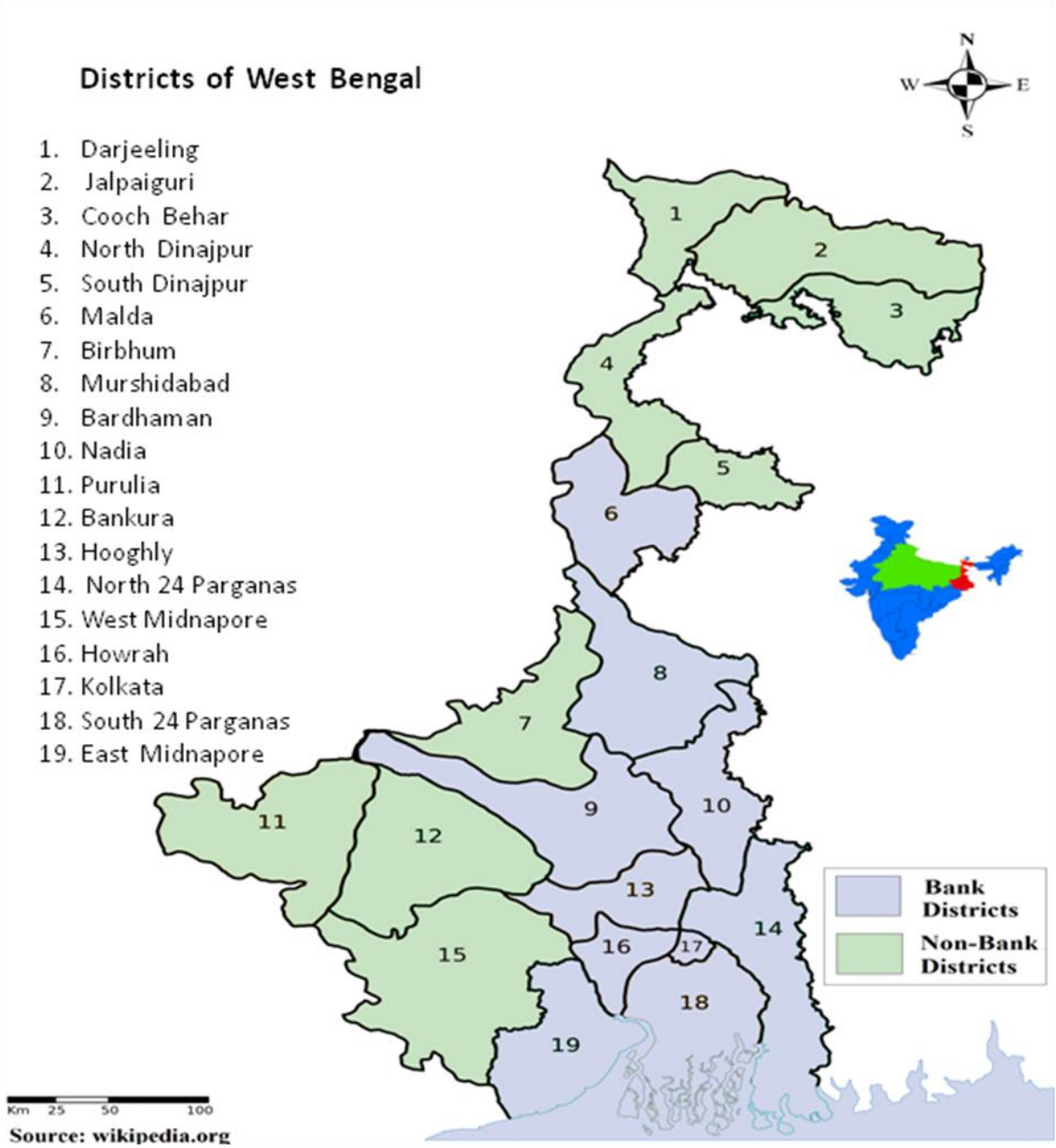
Map 2: Location of Uttarakhand (with districts) in the Ganga Basin and in India



Map 3: Location of Uttar Pradesh (with regions) in the Ganga Basin and in India



Map 4: Location of Bihar in the Ganga Basin and in India



Map 5: Location of West Bengal in the Ganga Basin and in India

3. An Overview of the Health Status

Increasing population pressure, rapid industrialization, and agricultural activities in the Ganga Basin adversely affect the quality of drinking water and as a result health of the people. Direct discharge of untreated industrial effluents and domestic sewerage, dumping of animal carcasses, bathing and ritualistic practices, including immersion of idols and floral materials in the river, open defecation and finally the non-point sources of pollution in the form of seepage of pesticides and chemical fertilizers, have become main sources of degradation of surface and ground water resources. Ganga River has slowly

become the safe haven for viruses and bacteria mainly causing deadly diseases like dysentery, cholera, hepatitis A, typhoid fever etc. Diarrhea, as per global health figures, is said to be the second largest contributor for child mortality rates (IMR) in the world and India as well. The factors like unsafe drinking water, poor sanitation and hygiene conditions are undoubtedly the most to blame. These issues will be examined in the ensuing sections. Here, we briefly discuss some vital statistics, such as birth rates, death rates, IMR, CMR, expectation of life at birth to assess the general health profile of people in the Ganga basin (refer Table 1).

Table 1: Overview of Health Profile in Ganga Basin States and India

States	Birth Rate *			Death Rate*			Infant Mortality Rate*			Child mortality Rate (0-4)**			Expectation of Life at Birth **		
	T	R	U	T	R	U	T	R	U	T	R	U	T	R	U
Bihar	28.1	28.8	22	6.8	7	5.6	48	49	38	14.7	15.1	9.9	61.6	60.7	67.5
UK	19.3	20.2	16.2	6.3	6.7	5.1	38	41	25	(-)	(-)	(-)	(-)	(-)	(-)
U. P.	28.3	29.2	24.2	8.1	8.5	6.3	61	64	44	20.1	21	15.4	60	59.2	64
W.B.	16.8	18.6	11.9	6	6	6.3	31	32	25	7.9	8.6	5.5	64.9	63.5	69.9
India	22.1	23.7	18	7.2	7.7	5.8	47	51	31	14.1	15.7	8.7	63.5	62.1	68.8

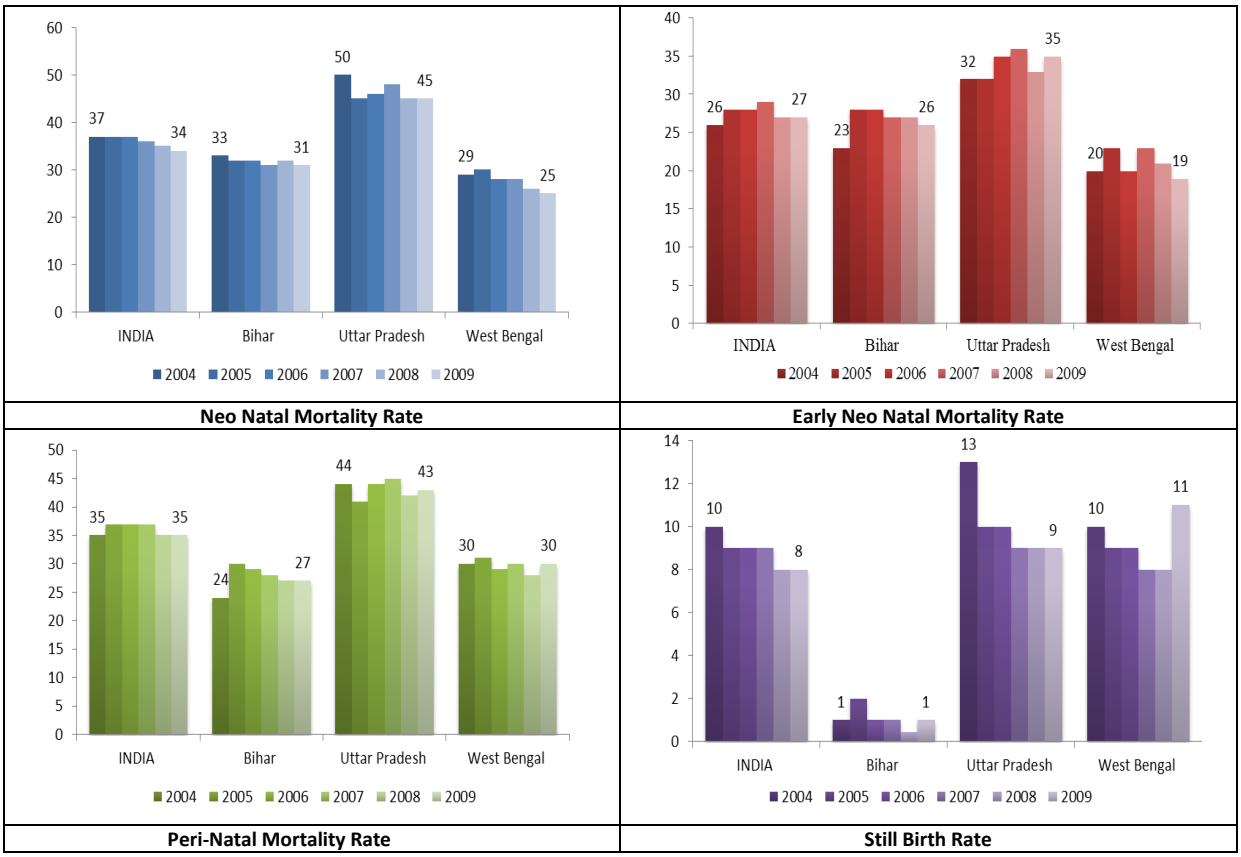
*Sources: * SRS Bulletin (December 2011), Census of India.*
*** Family Welfare statistics in India, 2011 Statistics Division Ministry of Health and Family Welfare, Government of India Note: * Birth Rate , Death Rate and Infant Mortality Rate (2010) .*
***Child Mortality Rate (2009) ** Expectation of Life at Birth (2002-2006)(Latest available)*

The data shown in Table 1 clearly reveals that overall the birth rate (BR) was observed highest in Uttar Pradesh (28.3), closely followed by Bihar (28.1) and lowest in West Bengal (16.8).BRs in Uttarakhand and West Bengal were lower than the national average, while in most populated Uttar Pradesh and Bihar states, these rates were higher than the national average. Further, BRs were observed much higher in rural than urban areas in all the states. Death rate (DR) was also observed highest in Uttar Pradesh (8.1) and lowest in West Bengal (6.0). Except for Uttar Pradesh, DRs were lower in the basin states than the national average. The table also indicates that DR was higher in rural than urban areas in all the basin states. Infant mortality rate (IMR), an important indicator of health status, was found highest in Uttar Pradesh (61), followed by Bihar (48). It was lowest in West Bengal (31). This shows that IMR in Uttar Pradesh was just double that of West Bengal. Rural-urban difference in the IMR is substantial in all the states. Since, urban

households have better access to healthcare infrastructure than their rural counterparts; the lower incidence of infant mortality in the urban areas is quite obvious.

The child mortality rate (CMR), which can be acted as a good proxy for the incidence of water borne diseases, depicted that Bihar and Uttar Pradesh had its higher magnitude; whereas West Bengal had its lower incidence. Overall status of these primary health indicators shows that the states in the basin do not have adequate healthcare infrastructure and water purification and sanitation facilities. Overall CMR in Uttar Pradesh (20.1) was more than two and half times that of West Bengal (7.9). In urban areas, IMR in Uttar Pradesh was 15.4, whereas in West Bengal, it was only 5.5. As far as life expectancy at birth is concerned, it was observed highest in West Bengal (64.9) and lowest in Uttar Pradesh (60). Further, it was found much higher in urban than rural areas in all the states. It can be concluded from the data presented in Table 1 that overall health profile was better in West Bengal and Uttarakhand. The health status was poor in Uttar Pradesh and Bihar. It may be mentioned here that public healthcare infrastructure was far better in Uttarakhand and West Bengal than Uttar Pradesh and Bihar (see next section). Therefore, better health status of West Bengal and Uttarakhand may be attributed to the better public healthcare infrastructure in these two states of the Ganga Basin.

Figure 1 shows neo-natal mortality rate, early neo-natal mortality rate, peri-natal mortality rate and still birth rate in the three states of the Ganga Basin. Data for Uttarakhand was not available. These indicators reflect on several aspects related to health infrastructure and environmental condition and pollution. A perusal of the Figure reveals that all these rates were highest in Uttar Pradesh and lowest in West Bengal (except still birth rate which was lowest in Bihar). As against 45 neo-natal mortality rate in Uttar Pradesh in 2009, the corresponding rate in West Bengal was only 25. Similarly, early neo-natal mortality rate in Uttar Pradesh was 35 in 2009, while in West Bengal, it was only 19, Peri-natal mortality rate was also found highest in Uttar Pradesh (43) and lowest in West Bengal (30). These rates again suggest that the health status in West Bengal is better than Uttar Pradesh and Bihar.



Source: Family welfare statistics of India (2011), Statistics Division, Ministry of Health and Family Welfare, GOI

Figure 1: State-wise Neo-natal, Early Neo-natal, Peri-natal and Still Birth Rates (2004 to 2009)

Part I: State-Wise Analysis

4. Health Care Infrastructure

Since number of factors such as adequate food, housing, basic sanitation, healthy lifestyles, protection against environmental hazards and communicable diseases have their impact on health, the definition of health is extended beyond the narrow limits of medical care. Thus "health care" implies more than "medical care". It includes a multitude of "services provided to individuals or communities by agents of the health services or professions, for the purpose of promoting, maintaining, monitoring or restoring health" (Park, 2011). Health infrastructure is an important indicator to understand the healthcare delivery provisions and mechanisms in a country/region. It is divided into two categories, viz., service infrastructure and educational infrastructure. Service infrastructure in health include details of Sub-centers, PHCs, CHCs, Government hospitals, allopathic hospitals and hospital beds, etc., while educational infrastructure provides details of medical colleges, nursing and paramedical colleges etc.

4.1 Service Infrastructure

Healthcare services are designed to meet the health needs of the community through the use of available knowledge and resources. The purpose of these services is to improve the health status of the population through morbidity and mortality reduction, high life expectancy, low population growth rate, improvement in nutritional status, and basic sanitation. Health services are provided by Sub-centres, PHCs, CHCs and government hospitals.

4.1.1 Sub-centres

Sub-centre is the peripheral outpost of the existing health delivery system in rural areas. It acts as a first contact point between the primary healthcare system and the community. Each sub-centre is required to be manned by at least one Auxiliary Nurse Midwife (ANM)/Female Health Worker and one Male Health Worker. One sub-centre is established to serve 5000 persons in plain areas and 3000 persons in hilly areas. These centres are assigned tasks relating to interpersonal communication in order to bring about behavioral change and provide services in relation to maternal and child health, family welfare, nutrition, immunization, diarrhea control and control of communicable diseases. They are provided with basic medicines for minor ailments needed for taking care of essential health needs of population (GOI, National Health Profile, 2012).

Table 2 shows that number of sub-centres functioning in the Ganga Basin has increased from 30052 during the 6^{th} Plan to 42338 during the 11^{th} Plan. However, its share in the

overall number of sub-centres of India has declined from 35.62% to 28.58% during the same period, implying that the number of sub-centres in the non-basin states grew faster than that in the basin states. Within the Ganga Basin, Uttar Pradesh accounts for a major proportion of sub-centres i.e. more than 48%, whereas Uttarakhand has only around 4%. Table 2 also shows that the number of sub-centres functioning in Uttar Pradesh and Uttarakhand has remained same during the 10th and the 11th Plans, while the number in the Ganga Basin as well as in India has increased over the period of time. Bihar accounted for 22.69% of total sub-centres of the basin in the 11th Plan. The number of sub-centres in Bihar has gone up from 8299 in the 6th plan to 14799 in the 9th Plan. However, the number went down in the 10th Plan due to bifurcation of the State. In West Bengal, the number has increased constantly up to the 10th Plan and then remained at the same level in the 11th Plan.

Table 2: Plan-wise Number and Percentage of Health sub-centers in UP, UK, Bihar, WB, Ganga Basin and all India

Location	Sixth Plan [1981-85]	Seventh Plan [1985-90]	Eighth Plan [1992-97]	Ninth Plan 1997-2002]	Tenth Plan [2002-2007]	Eleventh Plan [2007-2012]
Uttarakhand	(--)	(--)	(--)	(--)	1,765	1,848
UK % from Ganga Basin	(--)	(--)	(--)	(--)	*4.25%*	*4.37%*
UK % from India	(--)	(--)	(--)	(--)	*1.21%*	*1.25%*
Uttar Pradesh	15,653	20,153	20,153	20,153	20,521	20,521
UP % from Ganga Basin	*52.09%*	*47.06%*	*47.06%*	*46.78%*	*49.39%*	*48.48%*
UP % from India	*18.55%*	*15.48%*	*14.79%*	*14.68%*	*14.13%*	*13.85%*
Bihar*	8299	14799	14799	14799	8,909	9,606
BR % from Ganga Basin	*27.62%*	*34.56%*	*34.56%*	*34.35%*	*21.44%*	*22.69%*
BR % from India	*9.84%*	*11.37%*	*10.86%*	*10.78%*	*6.13%*	*6.49%*
West Bengal	6,100	7,873	7,873	8,126	10,356	10,356
WB % from Ganga Basin	*20.30%*	*18.38%*	*18.38%*	*18.86%*	*24.92%*	*24.46%*
WB % from India	*7.23%*	*6.05%*	*5.78%*	*5.92%*	*7.13%*	*6.99%*
Ganga Basin	30,052	42,825	42,825	43,078	41,551	42,331
Basin % from India	*35.62%*	*32.90%*	*31.43%*	*31.37%*	*28.60%*	*28.58%*
All India Total	84,376	1,30,165	1,36,258	1,37,311	1,45,272	1,48,124

**There is a reduction in the number of Centres functioning at the end of 10th Plan as compared to those functioning at the end of Ninth Plan due to the division of State.*

Source: RHS 2012

Although an extensive infrastructural network of medical and health services in the government as well as private sectors has been created over the years, the available health infrastructure is inadequate to meet the demand for health services. The inadequacy of

health infrastructure in terms of number of sub-centres in the Ganga Basin is presented in Table 3.

Table 3: Required, Position and Shortfall in Health Infrastructure in Sub-centres

State/ UT	Required			in Position			Shortfall		
	2008	2010	2012	2008	2010	2012	2008	2010	2012
Uttarakhand	1294	1294	2341	1765	1765	1848	*	*	493
Uttar Pradesh	26344	26344	31037	20521	20521	20521	5823	5823	10516
Bihar	14959	14959	18533	8858	9696	9696	6101	5263	8837
West Bengal	12101	12101	13186	10356	10356	10356	1745	1745	2830
Ganga Basin	54698	54698	65097	41500	42338	42421	13669	12831	22676
India	158792	158792	189094	146036	147069	148366	20486	19590	43776

*Note : *Surplus*

Source: RHS Bulletin 2008,2010,2012

Table 3 shows that the existing sub-centres in the Ganga Basin as well as in India are inadequate to meet out the requirement. For instance, in Uttar Pradesh, there was a shortfall of 10516 sub-centres in 2012. This amounts to about 48% of total shortfall of sub-centres in the Ganga basin. At the Basin level, there was a requirement of 22033 additional sub-centres in 2012. It is significant to note that the Ganga Basin constituted about 62% of India's total shortfall of sub-centres. As far as sub-centres functioning in Uttarakhand are concerned, these are reported to be higher than the requirement during all the three years. In Bihar and West Bengal, there exists a huge gap between the number of sub-centres required and the number of sub-centres in operation, as is demonstrated by Table 3. If we estimate the ratio of sub-centres in position to the number of sub-centres required, we find that the ratio was lowest in Bihar (0.52), followed by Uttar Pradesh (0.66) and West Bengal (0.78). Thus, except for Uttarakhand, all other states of the Basin have reported shortfall in the sub-centres. The situation is quite serious in Bihar.

4.1.2 Primary Health Centre (PHC)

PHC is the first contact point between village community and the medical officer. It functions as health service institution with little community involvement. The PHCs were envisaged to provide an integrated curative and preventive health care to the rural population with emphasis on preventive and promotional aspects of healthcare. One PHC is to cover a population of 20,000 in hilly/ tribal/ difficult areas and 30,000 in plain areas. As per minimum requirement, a PHC is to be manned by a medical officer supported by 14 paramedical and other staff. Under NRHM, there is a provision for two additional staff nurses at PHCs on contact basis. It acts as a referral unit for 6 sub-centres and has 4 to 6 beds for patients. PHCs provide curative, preventive, promotional and family welfare services (GOI, National Health Profile, 2012).

Table 4 shows that the number of PHCs in the Ganga Basin has increased substantially from 3137 in the 6th Plan to 7279 in 9th Plan and thereafter the number declined to 6703 in the 11th Plan. The share of the Ganga Basin in the total PHCs of the country shows a continuous decline over the period. It has gone down from 34.42% in 6th Plan to 28.06% in the 11th Plan. This implies that the number of PHCs has grown faster in non-basin states of India. Uttar Pradesh has the highest share (55%) in the total PHCs working in the basin, followed by Bihar (27.72%) and West Bengal (13.52%). However, these percentages do not imply that Uttar Pradesh has better healthcare infrastructure in terms of number of PHCs than the other states because Uttar Pradesh is the largest state in terms of population and area.

Table 4: Plan-wise Number and Percentage of PHCs in UP, UK, Bihar, WB, Ganga Basin and all India

Location	Sixth Plan [1981-85]	Seventh Plan [1985-90]	Eighth Plan [1992-97]	Ninth Plan [1997-2002]	Tenth Plan [2002-2007]	Eleventh Plan [2007-2012]
Uttarakhand	(-)	(-)	(-)	(-)	232	257
UK % from Ganga Basin	*(-)*	*(-)*	*(-)*	*(-)*	*3.59%*	*3.82%*
UK % from India	*(-)*	*(-)*	*(-)*	*(-)*	*1.04%*	*1.08%*
Uttar Pradesh*	1,169	3,000	3,761	3,808	3,660	3,692
UP % from Ganga Basin	*37.26%*	*47.99%*	*52.00%*	*52.31%*	*56.64%*	*54.93%*
UP % from India	*12.83%*	*16.07%*	*16.98%*	*16.65%*	*16.36%*	*15.46%*
Bihar*	796	2001	2209	2209	1648	1863
BR % from Ganga Basin	*25.37%*	*32.01%*	*30.54%*	*30.35%*	*25.50%*	*27.72%*
BR % from India	*8.73%*	*10.72%*	*9.97%*	*9.66%*	*7.37%*	*7.80%*
West Bengal	1,172	1,250	1,262	1,262	922	909
WB % from Ganga Basin	*37.36%*	*20.00%*	*17.45%*	*17.34%*	*14.27%*	*13.52%*
WB % from India	*12.86%*	*6.69%*	*5.70%*	*5.52%*	*4.12%*	*3.81%*
Ganga Basin	3,137	6,251	7,232	7,279	6,462	6,721
Basin % from India	*34.42%*	*33.48%*	*32.65%*	*31.82%*	*28.89%*	*28.14%*
India	9,115	18,671	22,149	22,875	22,370	23,887

* : *There is a reduction in the number of Centres functioning at the end of 10th Plan as compared to those functioning at the end of Ninth Plan due to the division of State*

Source: RHS 2012

It may be noted that these PHCs came under criticism as these were not able to provide adequate health coverage partly due to ill-equipped staff and partly because of coverage of a large population of one lakh or more. Table 5, makes it clear that the number of PHCs in operation was much lower than the number required, Uttarakhand being an exception. In Uttar Pradesh, against the requirement of 5172 PHCs in 2012, the actual number of PHCs in position was only 3692 (71% of the requirement). The ratio of number of PHCs in position to the number of PHCs required in 2012 is estimated to be lowest in West Bengal (0.42), followed by Bihar (0.60) and Uttar Pradesh (0.71). In the Ganga Basin as a whole, the actual

number of PHCs met only 63% of the requirement in 2012. Thus, the situation of healthcare infrastructure in terms of number of PHCs is quite alarming in the basin in general and West Bengal in particular.

Table 5: Required, Position and Shortfall in Health Infrastructure in PHCs

State /UT	Required			in Position			Shortfall		
	2008	2010	2012	2008	2010	2012	2008	2010	2012
Uttarakhand	214	214	351	239	239	257	*	*	94
Uttar Pradesh	4390	4390	5172	3690	3692	3692	700	698	1480
Bihar	2489	2489	3083	1641	1863	1863	848	626	1220
West Bengal	1993	1993	2166	924	909	909	1069	1084	1257
Ganga Basin	9086	9086	10772	6494	6703	6721	2617	2408	4051
India	26022	26022	30565	23458	23673	24049	4477	4252	7954

Note: Surplus*

Source: RHS Bulletin 2008,2010,2012

4.1.3 Community Health Centre (CHC)

CHCs are established and maintained by the State Government under the MNP/BMS programme. Four medical specialists i.e. Surgeon, Physician, Gynecologist and Pediatrician supported by paramedical and other staff are required in each CHC as per norms. It serves as a referral centre for 4 PHCs and also provides facilities for obstetric (relating to childbirth) care and specialist consultations. One CHC cover population of 80,000 in hilly/tribal/difficult areas and 1,20,000 in plain areas (GOI, National Health Profile, 2012). The specialists at the CHC may refer a patient directly to the state level hospital or nearest appropriate medical college hospital, as may be necessary, without the patient having to go first to the sub-divisional or district hospital (Park, 2011).

Table 6 shows that the number of CHCs in the Ganga Basin has increased from 149 in the 6th Plan to 988 in the 11th Plan (a more than six-fold rise). In Uttar Pradesh, the number has gone up significantly from 74 in the 6th Plan to 515 in the 11th Plan. As the Table depicts, Uttar Pradesh accounted for the highest share in the total CHCs of the Basin (52%), followed by West Bengal (7.24%) and Bihar (7.06%). Except for Bihar, in all other states, the number of PHCs has increased during the Plan period. In case of Bihar, the number increased up to the 8th Plan and then declined mainly due to bifurcation of the State. However, after the formation of new State, Bihar did not report any increase in the number of PHCs, while after the bifurcation of Uttar Pradesh, the number of PHCs has increased in both Uttar Pradesh and Uttarakhand. A perusal of the Table reveals that the health infrastructure in terms of PHC is quite dismal in Bihar.

Table 6: Plan-wise Number and Percentage of CHCs in UP, UK, Bihar, WB, Ganga Basin and all India

Location	Sixth Plan [1981-85]	Seventh Plan [1985-90]	Eighth Plan [1992-97]	Ninth Plan [1997-2002]	Tenth Plan [2002-2007]	Eleventh Plan [2007-2012]
Uttarakhand	(-)	(-)	(-)	(-)	49	59
UK % from Ganga Basin	*(-)*	*(-)*	*(-)*	*(-)*	5.76%	5.95%
UK % from India	*(-)*	*(-)*	*(-)*	*(-)*	1.21%	1.23%
Uttar Pradesh*	74	177	262	310	386	515
UP % from Ganga Basin	49.66%	43.07%	52.51%	55.66%	45.36%	51.92%
UP % from India	9.72%	9.27%	9.95%	10.15%	9.54%	10.71%
Bihar*	52	147	148	148	70	70
BR % from Ganga Basin	*34.90%*	*35.77%*	*29.66%*	*26.57%*	*8.23%*	*7.06%*
BR % from India	*6.83%*	*7.70%*	*5.62%*	*4.85%*	*1.73%*	*1.46%*
West Bengal	23	87	89	99	346	348
WB % from Ganga Basin	15.44%	21.17%	17.84%	17.77%	40.66%	35.08%
WB % from India	3.02%	4.55%	3.38%	3.24%	8.55%	7.24%
Ganga Basin	149	411	499	557	851	992
Basin % from India	19.58%	21.52%	18.95%	18.24%	21.04%	20.63%
India	761	1,910	2,633	3,054	4,045	4,809

* : *There is a reduction in the number of Centres functioning at the end of 10th Plan as compared to those functioning at the end of Ninth Plan due to the division of State*

Source: RHS 2012

Table 7 indicates that the shortfall in CHCs was quite high in all the basin states. In 2012, as against 1293 CHCs required in Uttar Pradesh, the actual number was only 515, thus a deficit of 778 CHCs. In other states also, the shortfall is substantial, as is obvious from Table 7. If we estimate the ratio of number of CHCs in position to the CHCs required, we find that the ratio in 2012 was lowest in Bihar (0.09), distantly followed by Uttar Pradesh (0.40), West Bengal (0.62) and Uttarakhand (0.63). The ratio at the basin level was much lower (0.37) than the all-India level (0.63). This implies that the non-basin states have relatively better healthcare infrastructure in terms of number of CHCs. Among the basin states, Bihar shows the alarming situation in terms of shortfall in the CHCs.

Table 7: Required, Position and Shortfall in Health Infrastructure in CHCs

State /UT	Required			in Position			Shortfall		
	2008	2010	2012	2008	2010	2012	2008	2010	2012
Uttarakhand	53	53	87	55	55	59	*	*	28
Uttar Pradesh	1097	1097	1293	515	515	515	582	582	778
Bihar	622	622	770	70	70	70	552	552	700
West Bengal	498	498	541	349	348	348	149	150	193
Ganga Basin	2270	2270	2691	989	988	992	1283	1284	1699
India	6491	6491	7631	4276	4535	4833	2337	2115	3044

Note:* Surplus

Source: RHS Bulletin 2008,2010,2012

4.1.4 Govt. Hospitals

No country in the world is committed to universal health care at affordable cost without the active participation of the government. So, for making people healthy, public sector plays a dominant role in provision of health services. Health services are provided by the government through the government hospitals established in rural as well as urban areas. Table 8 shows that out of total government hospitals functioning in the country, 2440 (20.35%) are working in the Ganga Basin till 2011, including 1606 (21.86%) in rural areas and 834 (20.12%) in urban areas. Uttar Pradesh has 35.29% (including 32.07% in rural areas and 41.49% in urban areas) of total Basin's hospitals in 2011 which has declined from 46.54% in 2010. Uttarakhand contributed 28.48% (including 41.47% in rural areas and 3.48% in urban areas) to the Basin's pool of government hospitals in 2011. Contrary to sub-centres, PHCs and CHCs, number of government hospitals in Uttarakhand (666 in 2011) was more as compared to Uttar Pradesh (515 in 2011) since 2008, but in urban areas there were only 29 government hospitals in Uttarakhand as compared to 346 in Uttar Pradesh in 2011. Although number of availability of beds in government hospitals in the Ganga Basin has increased, its share in total beds of the country has declined from 22.77% in 2008 to 19.63% in 2011. In case of Uttar Pradesh and Uttarakhand, the availability of number of beds has remained same during 2010 and 2011(56384 and 7965 respectively). However, their share in the total number of beds of the basin as declined, respectively from 47.34% and 6.69% in 2010 to 36.60% and 5.57% in 2011.

The inadequacy of government hospitals is clear from Figure 2 and 3 which shows the average population served per government hospital and average population served per government hospital bed in the Ganga basin states. On an average one government hospital in Uttar Pradesh provides health services to 229118 persons as compared to 13685 persons in Uttarakhand and 139676 in West Bengal during 2011. However, the number for Bihar is even higher at 451325. The average population served by one government hospital in Uttar Pradesh (2011) was much higher than the national average. A perusal of Figure 2 reveals that there has been significant variation in the number of persons served per hospital across time in the basin states. During 2008, the highest number of persons per hospitals was estimated in West Bengal, followed by Uttar Pradesh, while during 2011. It was Bihar which had the highest number, distantly followed by Uttar Pradesh.

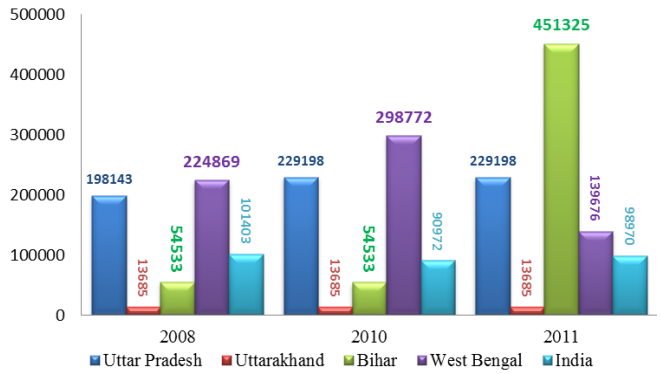


Figure 2: Average Population Served Per Govt. Hospital

Table 8 : Number of Govt. Hospitals & Beds in Rural & Urban Areas (Including CHCs) In India

Location	Rural Hospitals						Urban Hospitals						Total Hospitals					
	No.			Beds			No.			Beds			No.			Beds		
	2008	2010	2011	2008	2010	2011	2008	2010	2011	2008	2010	2011	2008	2010	2011	2008	2010	2011
Uttar Pradesh	397	515	515	11910	15450	15450	528	346	346	20550	40934	40934	925	861	861	32460	56384	56384
% from Basin	34.17	43.1	32.07	57.19	71.54	44.5	62.78	52.82	41.49	29.66	41.98	34.3	24.87	46.54	35.29	28.83	47.34	36.6
% from India	6.3	7.58	7.01	8.36	10.32	9.6	19.03	9.23	8.35	6.34	10.25	6.62	8.19	6.75	7.18	6.56	9.78	7.18
Uttarakhand	666	666	666	3746	3746	3746	29	29	29	4219	4219	4219	695	695	695	7965	7965	7965
% from Basin	57.31	55.73	41.47	17.99	17.35	10.79	3.45	4.43	3.48	6.09	4.33	3.54	18.68	37.57	28.48	7.07	6.69	5.17
% from India	10.57	9.8	9.06	2.63	2.5	2.33	1.05	0.77	0.7	1.3	1.06	0.68	6.16	5.45	5.8	1.61	1.38	1.01
Bihar	NA	NA	61	NA	NA	1830	NA	NA	169	NA	NA	16686	1717	1717	230	22494	22494	18516
% from Basin	NA	NA	3.8	NA	NA	5.27	NA	NA	20.26	NA	NA	13.98	46.16	92.81	9.43	19.98	18.89	12.02
% from India	NA	NA	0.83	NA	NA	1.14	NA	NA	4.08	NA	NA	2.7	15.21	13.46	1.92	4.55	3.9	2.36
West Bengal	99	14	364	5171	2399	13693	284	280	290	44510	52360	57498	383	294	654	49681	54759	71191
% from Basin	8.52	1.17	22.67	24.83	11.11	39.44	33.77	42.75	34.77	64.25	53.7	48.18	10.3	15.89	26.8	44.12	45.97	46.21
% from India	1.57	0.21	4.95	3.63	1.6	8.51	10.24	7.47	6.99	13.73	13.12	9.29	3.39	2.3	5.45	10.05	9.49	9.07
Ganga Basin	1162	1195	1606	20827	21595	34719	841	655	834	69279	97513	119337	3720	1850	2440	112600	119108	154056
% from India	18.45	17.59	21.86	14.63	14.43	21.58	30.32	17.48	20.12	21.37	24.43	19.29	32.95	14.5	20.35	22.77	20.65	19.63
India	6298	6795	7347	142396	149690	160862	2774	3748	4146	324206	399195	618664	11289	12760	11993	494510	576793	784940

Notes: Figures are for varying periods and thus are provisional and subject to change

Source: Directorate General of Health Services

Figure 3 shows the state-wise average population served per hospital bed. It is observed that Uttarakhand and West Bengal had number of persons per hospital bed lower than the national average, while Uttar Pradesh and Bihar had the number greater than the national average. The Figure also indicates that the number of persons per hospital bed had substantial variation across states and over time. For instance, during 2008, number of persons served per hospital bed was highest in Uttar Pradesh (5646), followed by Bihar (4163), while during 2011, it was Bihar which had the highest number of persons per hospital bed (5606), followed by Uttar Pradesh (3499). Thus, Uttarakhand and West Bengal had relatively better infrastructure in terms of beds in government hospitals than Uttar Pradesh and Bihar.

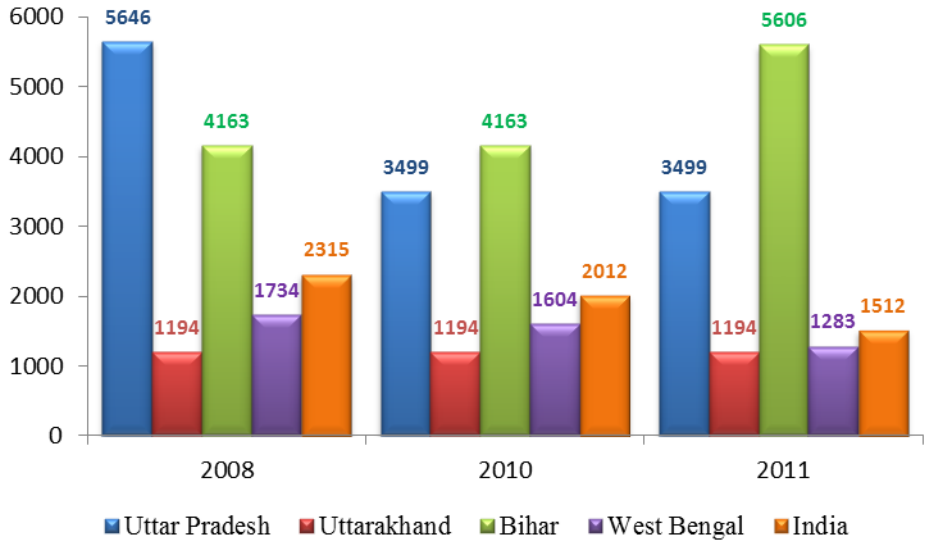


Figure 3: Average Population Served per Govt. Hospital Bed

4.2 Education Infrastructure

Educational infrastructure includes the educational institutes and courses provided in the states for betterment of health services through better knowledge.

4.2.1 Medical Colleges

Medical College refers to an educational institution that provides medical education through different medical courses. These colleges are generally having hospitals attached to them. These colleges consist of number of medical specialists for different departments. But the availability of medical colleges is not appropriate in relation to the population. The highly uneven distribution of medical colleges has resulted in the skewed production and unequal availability of doctors even across the country. There is, for instance, only one medical college for a population of 11.5 million in Bihar and 9.5 million in Uttar Pradesh, compared to Kerala and Karnataka who have one medical college for a population of 1.5 million (GOI, Planning Commission of India, 2011).

The educational infrastructure which has been shown through the availability of medical colleges in the basin is displayed by Table 9. As is clear from the Table, Uttar Pradesh has the highest number of medical colleges among the basin states (11 government and 14 private colleges), followed by West Bengal (12 governments and 2 private), Bihar (7 governments and 3 private) and Uttarakhand (2 governments and 2 private). Out of total 32205 beds in the hospitals attached to the medical colleges of the basin, more than 50% were only in Uttar Pradesh. Admission capacity in the hospitals attached to the medical colleges was also observed highest in Uttar Pradesh (3049), followed by West Bengal (1750).

Table 9: Medical Colleges in Ganga Basin and India (2011)

State	Government	Private	No. of Beds in Attached Hospital	Admission Capacity
Uttar Pradesh	11	14	17812	3049
Uttarakhand	2	2	2350	400
West Bengal	12	2	5883	1750
Bihar	7	3	6160	760
Ganga Basin	32	21	32205	5959
Non- Basin States	118	162	134977	34066
India	**150**	**183**	**167182**	**40025**

Source: National Health Profile, 2011

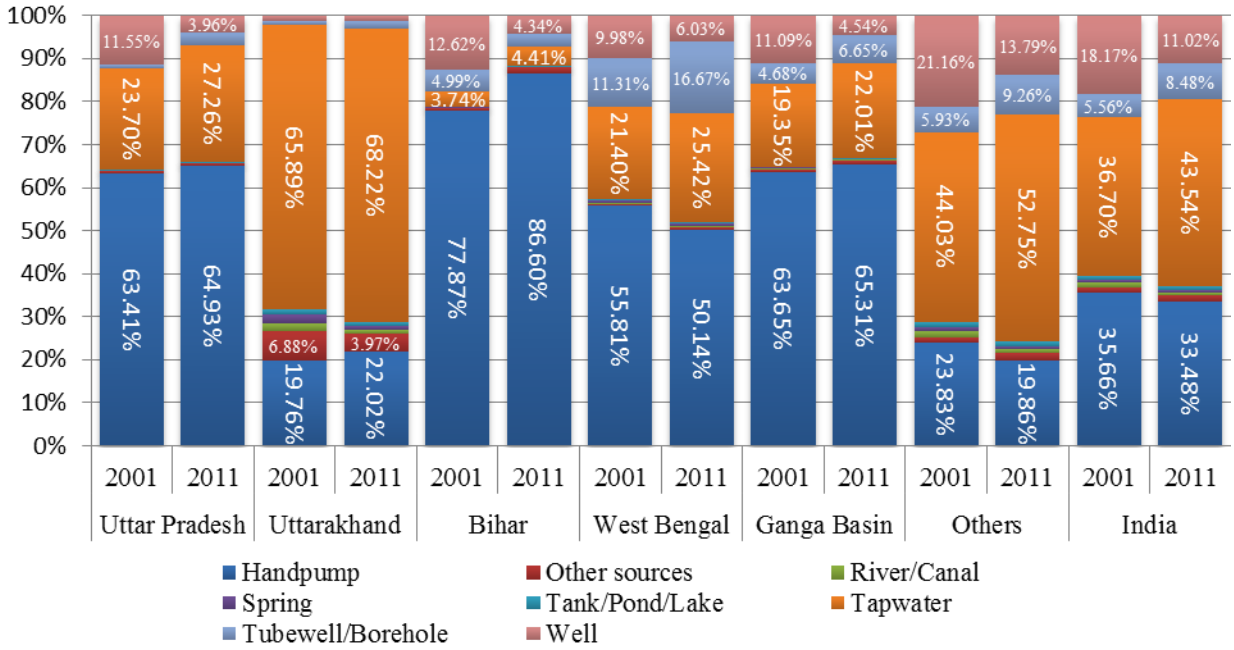
5. Water, Sanitation and Health

Supply of safe drinking water and provision of sanitation are the most important contributing factors for improving the health of the people in any country. Faeces deposited near homes, contaminated drinking water (sometimes caused by poorly designed or maintained sewage systems), fish from polluted rivers and coastal waters, and agricultural produce, fertilized with human waste are all health hazards. The lack of water supply and sanitation is the primary reason why diseases transmitted via faeces are so common in developing countries (Park, 2011). As per a World Health Organization (WHO) Report, 80 % of the diseases are due to unhygienic conditions and unsafe drinking water. It is estimated that every year about 1.5 million children under five years die in India due to water related diseases. (IIMC Report on the behalf of Rajiv Gandhi National Drinking Water Mission, 1998). The WHO/UNICEF Joint Monitoring Programme considers an ‘‘improved’’ water supply as ‘‘one that is likely to supply safe water’’ not injurious to health, such as a household piped water connection, a borehole, a protected dug well, a protected spring, or rainwater collection

5.1 Drinking Water Use and Its Sources

Water is the basic right of every citizen and to get clean and safe drinking water is even more so. The quality and quantity of water used for drinking are very important determinants of health condition. The source from where drinking water is collected by the household roughly indicates its quality (GOI, NSS Report, 2005). The most prevalent source of drinking water in India is ‘Tap water’.

Figure 4 shows the percentage distribution of households by sources of drinking water in India and in the Basin States. While at all-India level, tap water was the main source of drinking water as about 44% households used it as a source of drinking water; in the Ganga Basin, hand pump was the main sources as about 65% households used it as a main source. This clearly shows that hierarchy of uses of difference sources of drinking water varies across basin and non-basin states. The proportions of households reporting the use of drinking water from three dominating sources –'Tap water' , ' Hand pumps' and 'wells' in India were 44%, 34%, and 11%, respectively and in other states, these were 53%, 20% and 14%, respectively in 2011. The same three sources were also the most important sources in Ganga Basin till 2001, but this sequential order of 'wells' was replaced with 'Hand pumps' for the Ganga Basin in 2011.



Source: Census of India, 2001 and 2011.

Figure 4: Distribution of Households by Main sources of Drinking water

A significant point to note is that out of four states of Ganga basin, three states, namely, Uttar Pradesh, Uttarakhand and Bihar, witnessed increase in proportion of households using 'Hand pumps' and ' Tap water' as sources of drinking in 2011 over 2001. That's why estimates for Ganga basin also show such trends. But for other than Ganga basin states and all-India, it is the proportion of 'Tube wells/Borehole' and 'Tape water 'that has shown improvement in 2011 over 2001. One more point embraced from the above Figure is that the proportion of 'Tap water' has increased for all the states. This implies that access to safe drinking water had increased during the last decade.

5.1.1 Access to Safe Drinking Water

Safe water is one of the most important felt needs of public health. Water intended for human consumption should be both safe and wholesome. Safe water has been defined as the water which is: free from pathogenic agents; free from harmful chemical substances; pleasant to the taste, i.e.,

free from colour and odour; and usable for domestic purposes. It is said to be polluted when it does not fulfil these criteria.

Water pollution is a growing hazard in many developing countries owing to human activity. Without ample and safe water drinking, we cannot provide healthcare to the community. The biological contamination of large number of drinking water sources is a serious problem primarily due to prevalent open defecation and insanitary conditions around the drinking water sources, especially in rural areas. Table 9(a) shows that there has been improvement in access to safe drinking water in both rural and urban areas in the basin states and well as all India. The number of households having access to safe drinking water has increased significantly in all the states since 1981, as is apparent from the data shown in the Table. For instance, in Bihar, the number has gone up from 37.6% in 1981 to 94% in 2011. The similar increase is also observed in other basin states. However, increasing access of households to tap/hand pump/tube well water does not mean that the households have clean and safe drinking water. There may be possibility of contamination of drinking water due pollution of ground or surface water resources. This is the reason that some households spend lots of money to treat and purify the so-called safe drinking water before its use.

Table 9(a): Households (in %) Access to Safe Drinking Water (Tap/Hand pump/Tube well)

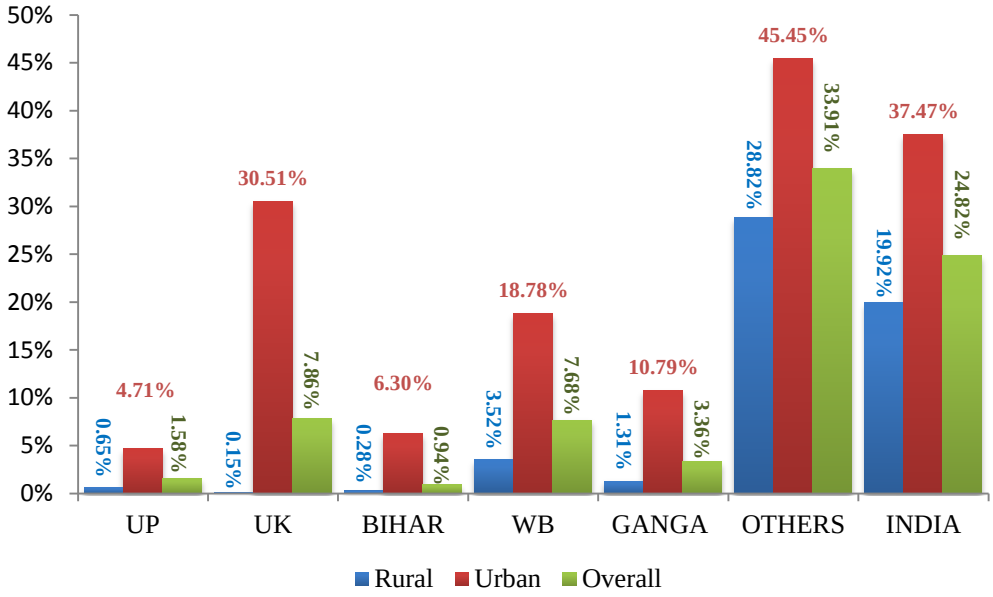
Location	1981			1991			2001			2011		
	Total	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban
Bihar	37.6	33.8	65.4	58.8	56.5	73.4	86.6	86.1	91.2	94	93.9	94.7
Uttar Pradesh	33.8	25.3	73.2	62.2	56.6	85.8	87.8	85.5	97.2	95.1	94.3	97.9
Uttarakhand	a	A	a	a	a	a	86.7	83	97.8	92.2	89.5	98.7
West Bengal	69.7	65.8	79.8	82	80.3	86.2	88.5	87	92.3	92.2	91.4	93.9
All India	38.2	26.5	75.1	62.3	55.5	81.4	77.9	73.2	90	85.5	82.7	91.4

Source : Economic Survey, 2012-13; Office of the Registrar General, Ministry of Home Affairs

**a - Created in 2001. Uttarakhand and Jharkhand for 1981 and 1991 are included under Uttar Pradesh and Bihar respectively.*

5.1.2 Purified Water and its Sources

Treatment or purification of water before its use can ensure some amount of precaution in respect of water related/water borne diseases. Figure 5 illustrates the proportion of households that treated water by various means before drinking. More than 35% households in urban and not less than 20% in rural areas were reported to treat the water before its use in India in 2004. Figure 5 demonstrates that rural as well as urban areas of non-basin states hold higher proportion of such households than the Ganga basin states. For instance, as against 3.36% of households using treated water in the Ganga Basin, the corresponding percentage in non-basin states was much higher at 33.91%. Within the Ganga Basin, the highest percentage of households using treated water was found in Uttarakhand (7.86%), closely followed by West Bengal (7.68%). It was observed lowest in Bihar. There is huge rural-urban disparity in the access of treated drinking water to the households. At the Basin level, just 1.31% of rural households treated water by any mean before drinking, compared to 10.79% of households in urban areas. The difference was highest in Uttarakhand, followed by West Bengal. As far as purification of water before drinking is concerned, the condition was dismal in Uttar Pradesh and Bihar.



Source: NSS 60th round Unit level data, 'Morbidity, Health Care and the Condition of the Aged, Jan.-June, 2004

Figure 5: Distribution of Households Having Water Treated Before Drinking, 2004

The choice of method for purification of water before drinking will depend on the quality of the water being treated, the cost of the treatment process and the quality standards expected of the processed water. Table 10 provides proportion of households treating water before drinking by various sources and per 1000 distribution of such households**.** Most of the rural as well as urban households used 'cloth screen' for purification of drinking water in India and in non-basin states. Among the households reporting purification of water before drinking, about 63% in the rural areas and nearly 42% in the urban areas used the traditional method of 'cloth screen' in non-basin states. However, in the Ganga basin states, mostly boiling process in urban areas and filtrations in rural areas were done to purify the drinking water. The most scientific method among the specified methods, 'Ultra-violet/resin/reverse osmosis', was also adopted by some rural and urban households in the basin, but with a huge difference. Out of total urban households who reported to use any method of water purification in the Ganga Basin, about 14% used R-O's as a source of treatment of drinking water, while the corresponding percentage of such households in other states was only 5%. In rural areas proportion of such households was quite less (4.58% in the Ganga Basin and 0.70% in the non-basin states).

Table 10 also shows the number of households per 1000 who treated the drinking water before its use in the Basin and Non-Basin states. It is observed that in both rural and urban areas, proportion of households using water treatment method was much higher in non-basin states than the basin states. For instance, as against 455 households per 1000 treating water before drinking in urban areas of non-basin states, the corresponding number in the basin was only 108. The difference is observed quite significant in case of rural households. Within the urban areas of the Ganga Basin

states, Uttarakhand stands at the top, followed by West Bengal, while in rural areas, it is the West Bengal, followed by Uttar Pradesh that holds the highest proportion of such types of households.

Table 10: Proportion of households treating water before drinking and per 1000 distribution of such households, 2004

Region	Sectors	Ultra-violet/ resin/ reverse osmosis	Filter	Boiling	Cloth screen	Any disinfectant	Others	No. per 1000 Treating water Before drinking
UP	Rural	13.66%	40.59%	11.44%	8.75%	0.69%	24.87%	7
	Urban	12.96%	11.72%	57.68%	8.87%	5.74%	3.02%	47
UK	Rural	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1
	Urban	6.03%	40.83%	50.47%	0.00%	0.00%	2.67%	305
Bihar	Rural	1.62%	41.06%	6.48%	37.69%	0.00%	13.16%	3
	Urban	0.00%	4.07%	95.41%	0.00%	0.00%	0.52%	63
WB	Rural	1.36%	29.75%	25.33%	21.46%	11.51%	10.59%	35
	Urban	16.20%	6.92%	72.22%	1.88%	1.10%	1.68%	188
Ganga	**Rural**	**4.58%**	**32.79%**	**21.02%**	**19.22%**	**8.34%**	**14.06%**	**13**
	Urban	**13.51%**	**11.03%**	**68.41%**	**3.11%**	**1.94%**	**2.00%**	**108**
Others	**Rural**	**0.70%**	**24.67%**	**8.65%**	**63.54%**	**0.94%**	**1.49%**	**288**
	Urban	**4.74%**	**26.39%**	**24.63%**	**42.10%**	**0.93%**	**1.21%**	**455**
India	Rural	0.78%	24.84%	8.92%	62.60%	1.09%	1.76%	199
	Urban	5.32%	25.37%	27.53%	39.51%	0.99%	1.27%	375

Source: NSS 60th round Unit level data, 'Morbidity, Health Care and the Condition of the Aged, Jan.-June, 2004

5.1.3 Bottled Water

The concept of safe drinking water has gained much importance in present scenario due to the awareness for health. Packaged water in bottles is considered as the safest source in the present scenario. These days, people are willing to use this expensive source to have a healthy life. The public perception, and probably the reality, is that bottled water is of high quality. This belief is encouraged by publicly reported problems with tap water and by aggressive advertising by the bottled water companies and water filter sales pitches. Highly subjective preferences for taste and flavor in water help to drive the market for bottled water. Water has different flavors and tastes depending on its origin, type and duration of storage, treatment, and method of delivery. Other than water quality, the most common reason offered to explain the growing use of bottled water is dissatisfaction with the taste of locally available tap water (Geick, 2004).

Figure 6 shows per 1000 distribution of households using bottled water as a source of drinking water in rural and urban areas of the basin states. In the Ganga basin, there were only 0.3% households which were using water bottles as compared to that of other states (5.2%) and India (1.6%). As against only 0.7% of urban households reported to use bottled water in the Ganga Basin, the percentage of such households in the non-basin states was 12.9%. Similarly, in rural area also, number of per 1000 distribution of households using bottled water was much higher in non-basin states than the basin states. Within the Ganga Basin, out of four states, Uttarakhand has the highest proportion of households of using bottled water i.e. 2.6% as compared to other basin states, such as

West Bengal (0.4%) and Uttar Pradesh (0.2%). In Bihar bottled water was not reported to be used for drinking as per NSS Report 2004.

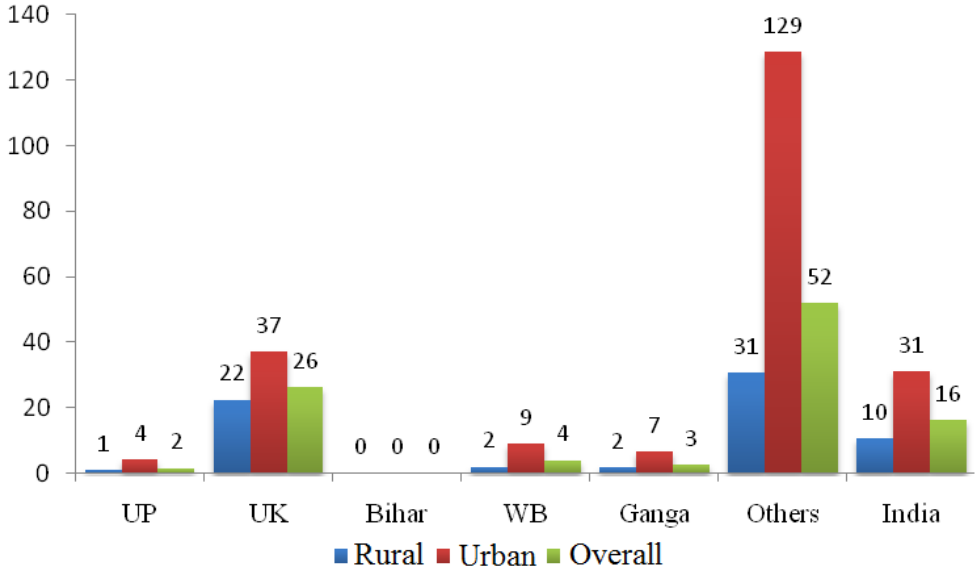


Figure 6: Per 1000 Distribution of Households Having 'Water Bottles' As Sources of Drinking Water, 2004

5.1.4 Expenditure on Purified Drinking Water

5.1.4.1 Expenditure on RO & Water Filters

According to the study by global consulting company, Frost and Sullivian (2010)[1], The Indian Point-of-Use (POU), water purifier market generated approximately Rs. 24,600 million in 2010. Water purifier segment in India is growing at a compounded annual growth rate (CAGR) of about 25% and is likely to touch Rs 7,0000 million by 2015 from the current level of about Rs 3,2000 million. According to a study titled, "Water-Purifier Industry in India: An Overview", the sales of water purifiers across India are likely to cross 15 million units by 2015 from the current level of over 7.8 million units. Growing at about 8% annually, the global water purifier industry is currently poised at about Rs 4.96 lakh crore and is likely to reach Rs 6.25 lakh crore by 2015. According to the report titled 'India Water Purifier Market Forecast & Opportunities, 2017' the water purifier market in India has shown tremendous growth opportunities in last couple of years. It is forecasted that the water purifier market in India will witness compounded annual growth rate of 25% till 2017 to make it a whooping USD 760 Million market by 2015.

There are three types of water purifiers marketed in India - the ultra-violet, reverse osmosis (RO) and resin- based one. RO-based purifiers are the most expensive - priced at Rs 13,000 and above, while UV-based purifiers are priced between Rs 5,000 and Rs 9,000. Non Electric water purifiers are more affordable at Rs 1,500 onwards (Das, 2013).

Table 11: Estimated Number of households surveyed by major source of drinking water and average household size

Regions	Sector	Types of water treatment								
		Ultra-violet/ resin/reverse osmosis	Filter	Boiling	Cloth screen	Any disinfectant	Others	Total	Avg. HH size	Total Households
UP	Rural	19501	57939	16335	12494	982	35501	142752	5.88	21834655
	Urban	39210	35465	174477	26823	17367	9150	302492	5.23	6416082
UK	Rural	1876	0	0	0	0	0	1876	5.00	1266408
	Urban	7932	53744	66435	0	0	3521	131632	3.94	431404
Bihar	Rural	495	12582	1986	11549	0	4034	30646	5.59	11019526
	Urban	0	3518	82421	0	0	450	86389	5.32	1370711
WB	Rural	5838	127829	108861	92208	49479	45511	429726	4.78	12208382
	Urban	139288	59530	621006	16166	9459	14486	859935	4.03	4577936
Ganga	Rural	27710	198350	127182	116251	50461	85046	605000	5.45	46328971
	Urban	186430	152257	944339	42989	26826	27607	1380448	5.48	12796133
Others	Rural	195669	6888109	2416089	17739956	261570	417011	27918404	4.61	96877649
	Urban	922230	5130511	4787751	8183589	179830	235978	19439889	4.61	42767919
India	Rural	223379	7086459	2543271	17856207	312031	502057	28523404	4.99	143206620
	Urban	1108660	5282768	5732090	8226578	206656	263585	20820337	4.39	55564052

Source: NSS 60th round Unit level data, 'Morbidity, Health Care and the Condition of the Aged, Jan.-June, 2004

Table 11 shows the distribution of surveyed households by types of treatment. Apart from traditional methods of water purification, some households in rural and urban areas both also used RO and filters to clean the drinking water. At the all-India level, 5.32% of urban households and 0.78% of rural households used RO to purify the drinking water, whereas the corresponding percentages in the Ganga Basin were 13.51 and 4.58, respectively. This reveals that the percentage of households using RO was much higher in the Ganga Basin than the other states of India. However, the percentage of households using RO varies significantly across the basin states. In case of urban area, the number of sample households using RO in Bihar was reported to be zero, while the corresponding number in West Bengal was 139288. In terms of absolute number of surveyed households using RO in urban areas, West Bengal stands first by having the highest number. It is followed by Uttar Pradesh and Uttarakhand. In rural areas, the number of surveyed households using RO was highest in Uttar Pradesh, followed by West Bengal. As far as percentage of households using RO is concerned, in rural areas, it was found highest in Uttarakhand (100%), followed by Uttar Pradesh (13.66%) and West Bengal (1.35%). In urban areas, the percentage was observed highest in West Bengal (16.20%), followed by Uttar Pradesh (12.96%) and Uttarakhand (6.02%).

The above analysis reveals that the percentage of surveyed households who used RO to purify drinking water was much higher in the Ganga basin than the rest of India. Table 11 also indicates that a large number of households used various methods to clean drinking water. All these water treatment methods put some monetary burden in terms of cost of treatment on the households. The highest cost was borne by those households who used RO. An effort has been made to assess the total cost incurred to the households who were using RO in the Basin as well as India. As per the

details shown in Table 11, 13.51% of urban households and 4.58% of rural households in the Ganga Basin used RO. Using these percentages, we estimate that there were 13.09 million households in urban areas and 2.12 million households in rural area which used RO to purify water. As we do not have information on the types of ultra-violet/ resin/reverse osmosis used by the households, we would not be able to estimate the actual amount of money spent by the households using these water purifying devices. We assume an average price of Rs.10000 per RO, including annual running and maintenance cost and then work out the total cost of RO in the Ganga Basin as well as India. The cost is estimated to be Rs.1,30,900 million in urban areas and Rs.21,200 million in rural areas of the Ganga Basin. Thus, approximately Rs. 1,52,100 million were spent on ROs by the households of the Ganga basin. At the all-India level, the total cost of ROs is estimated to be Rs.4,07,300 (Rs.2,95,600 million in urban and Rs.1,11,700 million in rural areas). Thus, the Ganga Basin shared about 37% of total expenditure made on ROs in India.

5.1.4.2 Expenditure on the Bottled Water

Some households also use bottled water in those areas where water from public sources is not found to be worth drinkable. However, number of such households is very low. Table12 provides the number of households who used the bottled water. Water is provided in a plastic container of 20 litres at a price of Rs.30 to 35 per container. Assuming per capita consumption of 3 litre water per day, we have estimated the total cost of bottled water used by the households in the Ganga Basin. Table 12 shows the estimates for the basin states, non-basin states and all-India. At the all-India level, total expenditure on bottled water is estimated to be Rs. 24,750.19 million (Rs.12,477.78 million in urban area and 12,272.41 million in rural area). In the Ganga Basin, the total expenditure on the bottled water is worked out to be Rs.1,422.66 million (Rs.749.18 million in urban areas and 673.48 million in rural areas). The share of the Ganga Basin in the India's total expenditure on the bottled water is only 5.75%. This implies that more number of households in non-basin states used bottled water that that in the Ganga Basin.

Looking at the state-wise estimates, it is observed that in rural areas, the highest expenditure on the bottled water was made in Uttarakhand, followed by Uttar Pradesh and West Bengal, while in urban areas, expenditure was highest in West Bengal, followed by Uttar Pradesh.

Table12 : Estimation of Total Expenditure on Water Bottle (based on NSS Report, 2004)

Regions	Sectors	Estimated Number of households using bottled water	Per Capita requirement of drinking water	Per liter cost of bottle water (Rs.)	Avg. HH size	Annual Expenditure on bottled Water (Rs. million)
UP	Rural	19228	3	1.5	5.88	185.70
	Urban	26115	3	1.5	5.23	224.33
UK	Rural	28459	3	1.5	5	233.72
	Urban	16009	3	1.5	3.94	103.60
Bihar	Rural	4712	3	1.5	5.59	43.26
	Urban	0	3	1.5	5.32	0
WB	Rural	22836	3	1.5	4.78	179.29
	Urban	41110	3	1.5	4.03	272.12
Ganga	Rural	75235	3	1.5	5.45	673.48
	Urban	83234	3	1.5	5.48	749.18
Others	Rural	1422117	3	1.5	4.61	10768.16
	Urban	1647250	3	1.5	4.61	12472.85
India	Rural	1497352	3	1.5	4.99	12272.41
	Urban	1730484	3	1.5	4.39	12477.78

Source: NSS 60th round Unit level data, 'Morbidity, Health Care and the Condition of the Aged, Jan.-June, 2004

From the above analysis, it can be concluded that people spend a huge some of amount on drinking water. Apart from this private expenditure on water, the government also spend more than one percent of GDP to provide access to safe drinking water to the households. If expenditure on ROs and bottled water is summed up, on an average, the households in the Ganga Basin spend about Rs.1,53,523 million on these two sources of safe drinking water. This amount could be saved if the households are provided access to safe drinking water. Poor households are the most sufferers due to degradation and contamination of water as they cannot afford to purchase costly RO and bottled water.

5.2 Sanitation and Drainage

5.2.1 Access to Toilets

Assemblage and treatment of human sewage and drainage is an issue that is closely associated to the safety of water supplies. When adequate sanitation is lacking, human faecal contamination of water transmits micro-organisms that cause diarrhea, cholera, and equally dangerous other water related diseases.

The WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation defines ''improved'' sanitation as household connection to a public sewer or septic system, a pour flush latrine, a simple pit latrine, or a ventilated improved pit latrine[2]. These condition necessary means that proportion of water closet (or, septic/ pour) flushes latrine or at least pit latrine must increase along with decline

in proportion of households that have no latrine facility. For a measurement of improvement in toilet facility this definition can work out. But in relation to water pollution, the types of latrine systems that can resist water related diseases should have an impervious floor to avoid seepage in ground water. Census 2011 of India surveyed households on four broad categories of latrine systems/processes that are installed or used by them. Table 13 provides proportion of household by availability of toilet connectivity enumerated during 2011 and comparative distribution of households by main categories of latrine in the Ganga basin, non-basin states and India in 2001 and 2011 respectively. Nearly half of India's 1.2 billion people did not have toilet at home. Only 46.9% of the households possessed toilets, while 49.8% defecated in the open. They squatted on roadsides, in agriculture fields or at railway tracks and defecated in the open. The remaining 3.2% used public toilets. Out of 46.9% of the households who possessed toilets, 36% had water closet and 9% had pit toilet.

Some more alarming signal is given by the Ganga Basin states where more than 60% of the households did not have toilet facility within premises, with highest percentage of such households (75%) were I in Bihar. Next to Bihar is Uttar Pradesh where 64.3% of households did not have toilets in their premises. The Uttar Pradesh is followed by West Bengal (having 41% households without toilets in their premises). In terms of access of households to toilet facilities, Uttarakhand has performed better than all other states of the basin.

Table 13: Percentage of Household by Availability of Toilet Connectivity , 2011

States	Latrine facility Available within premises	Flush/pour flush latrine connected to			Pit latrine		Other latrine			Latrine Not available within premises		
		Piped sewer system	Septic tank	Other system	With slab/ ventilated improved pit	Without slab/ open pit	Night soil disposed into open drain	Night soil removed by human	Night soil serviced by animal	Total	Public latrine	Open
Uttar Pradesh	35.65	8.10	19.91	1.77	3.44	0.74	0.46	0.99	0.24	64.35	1.32	63.04
Uttarakhand	65.77	11.79	40.00	1.42	11.29	0.58	0.34	0.24	0.13	34.23	1.14	33.08
Bihar	23.06	1.81	15.97	2.31	1.72	0.78	0.21	0.07	0.18	76.94	1.13	75.81
West Bengal	58.85	5.55	20.72	5.62	22.32	3.24	0.39	0.65	0.36	41.15	2.52	38.63
Ganga Basin	39.53	5.89	19.66	2.94	8.34	1.42	0.37	0.64	0.26	60.47	1.59	58.87
Others	50.07	14.54	23.28	1.99	7.32	1.98	0.60	0.19	0.18	49.93	3.95	45.98
India	46.92	11.95	22.20	2.28	7.63	1.81	0.53	0.32	0.20	53.08	3.24	49.84

Source: Census of India, 2011.

Among the Ganga Basin states, the highest decline in the percentage of households having 'no latrine' in Census 2011 over the preceding census was observed in Uttarakhand (20%), followed by

West Bengal, Bihar and Uttar Pradesh. This implies that the sanitary condition has improved in the basin states in 2011 over 2001. A perusal of Table13 reveals that the percentage of households having access to water closet toilets was higher in non-basin than the basin states. Within the basin states, the percentage of households with water closet toilets has increased significantly in West Bengal and Bihar, while it has actually declined both in Uttarakhand and Uttar Pradesh. Table 13 indicates that the distribution of households by the types of toilet varied significantly across the basin states.

Figure 7 shows that from 2001 to 2011, the proportion of households having 'no latrines within premises' have declined by almost 12% point in the non-basin states, by 7% point in the basin states and by 10% point in India. A significant point to note is that these declines were occurred due to the proportional increment of 'water closet' and 'Pit latrine' in the Ganga basin and only by 'water closet' in non-basin states.

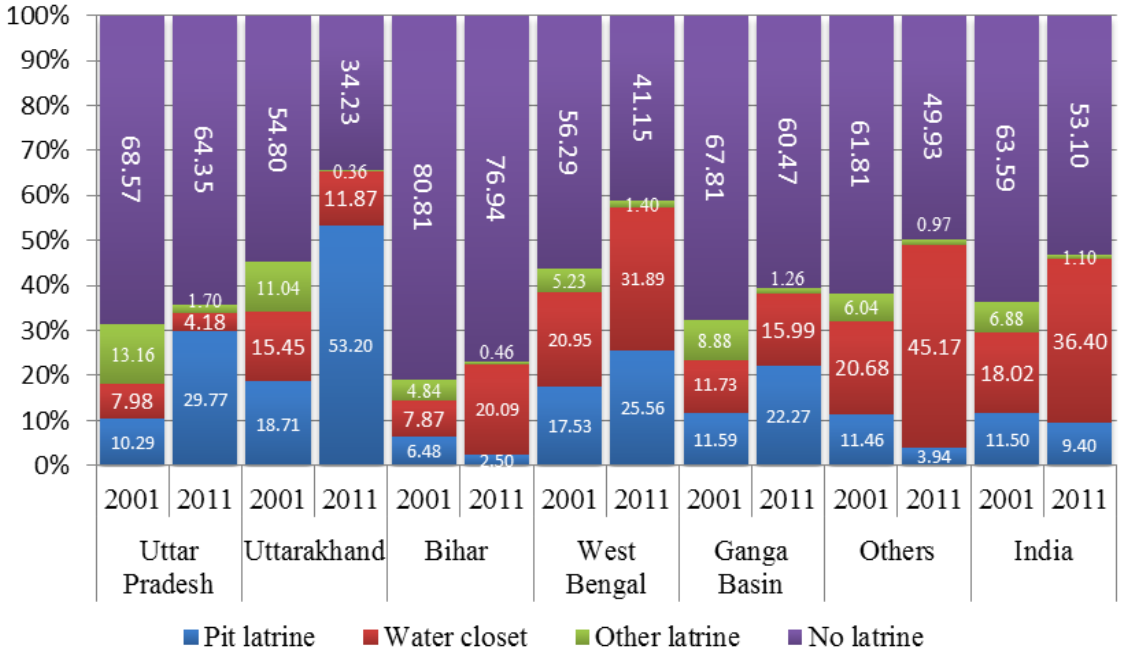


Figure 7: Distribution of Households by Main sources of Latrine

5.2.2 Access to Sewerage and Drainage Facilities

Drainage has a significant impact on the hygiene practices and health of population. There is a close linkage between the type of drainage system used by the households and intensity of water related diseases, particularly diarrhoea. Some studies confirm that improvement in the sewerage systems typically reduce diarrhea incidence by about 30% or perhaps as much as 60% when starting sanitation conditions are very poor. But in many contexts, sewerage might be less cost effective and less sustainable than onsite alternatives (Norman et. al,). Another study also shows that urban sanitation can have an impact on diarrheal disease, even without measures to promote hygiene behavior (Moraes et. al, 2003). In this regard, the presence of efficient drainage and sewerage system should be considered as important factor in the prevention of spread of waterborne diseases.

For analyzing the India's scenario regarding the sewage and sanitation condition, Census 2011 provides that at the country level, 48.9% households did not have any drainage facilities; while 33% of households have only open drainage system and the rest have closed drainage. This proportion of 'no drainage' households is more likely to pretentious of water related diseases. Figure 8 provides the distribution of households by types of drainage system used by them during 2001 and 2011. It can be revealed from the Figure that more than 48% of the households have 'no drainage' in the Ganga basin as well as in non-basin states. Among the Ganga Basin states, highest proportion of such households was observed in West Bengal (68%), followed by Bihar (58%), Uttarakhand (39%) and Uttar Pradesh (31%) in 2011.

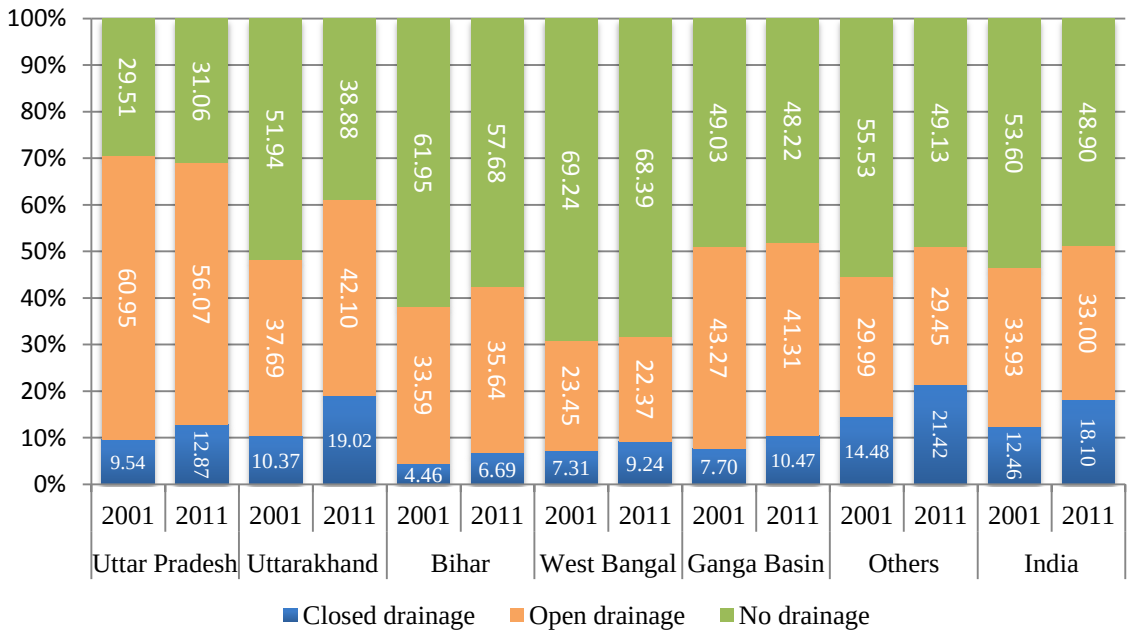


Figure 8: Distribution of Households by Sources of Drainage in the Ganga Basin

Figure 8 shows that from 2001 to 2011, highest decline in 'no drainage' households have been witnessed in the non-basin states. Among Ganga basin states, Uttarakhand shows the highest decline (13%), distantly followed by Bihar (4%).

5.3 Morbidity

5.3.1 General Morbidity by Proportion of Ailing Persons (PAP)

Ailment or illness or injury, mean any deviation from the state of physical and mental well-being. The prevalence of morbidity for any particular place can be evaluated as proportion of ailing persons (PAP). The 60th NSS round measures it as the number of persons reporting ailment during a 15-day period per 1000 persons for each region and for some broad age-groups. By using unit level records of this round, PAP for the Basin states has been estimated. Figure 9 shows that on an average, PAP was higher in urban than in rural areas. In the Ganga Basin, the difference in the PAP between urban and rural areas was 2.6% point, while at the country level, it was only 1.1% point. No much difference between rural and urban areas was observed in the non-basin states in this respect. Further, PAP in both rural and urban areas was observed higher in the Ganga Basin than the non-basin states. Within the basin states, in rural areas, it was observed lowest in Uttarakhand (52), closely followed by Bihar (53). The intensity of morbidity measured in terms of PAP was found highest in West Bengal, followed by Uttar Pradesh in rural and urban areas both.

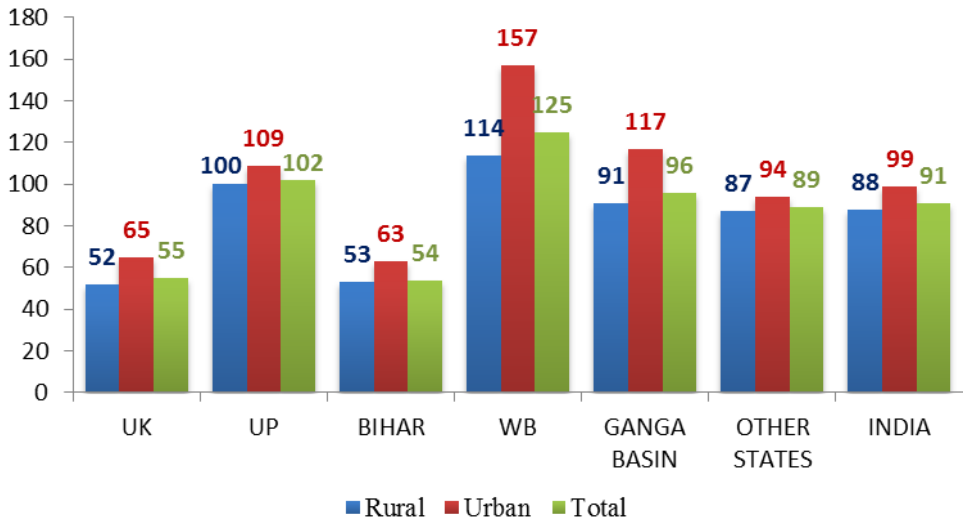
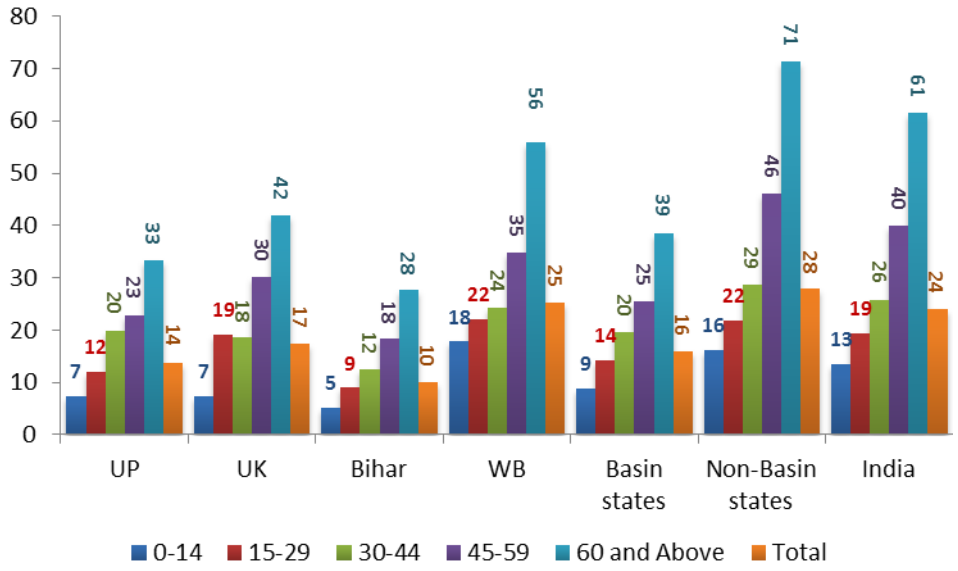


Figure 9: Number (per 1000) of persons reporting ailment (PAP) during a period of 15 days, 2004

5.3.2 General Morbidity by Number (per 1000) of Persons Hospitalised

As per the 60th NSS round, one was considered hospitalised if one had availed of medical services as an indoor patient in any hospital. For this survey, hospitals covered public hospitals, community health centres and primary health centres (if provided with beds), ESI hospitals, private hospitals, nursing homes, etc. Figure 10 demonstrates that number of persons hospitalised per 1000 population varies significantly across rural and urban areas and age group in the Basin states. A perusal of the Figure reveals that overall the number of persons hospitalised per 1000 in rural areas was highest in Uttarakhand (65), followed by Uttar Pradesh (48) and West Bengal (23). In urban areas also, Uttarakhand had the highest number, followed by West Bengal and Uttar Pradesh. As expected, the number of persons hospitalised per 1000 was highest in the age group 60 year and above, followed by age group 45-59 year. On an average, the number of persons hospitalised per 1000 was lowest in Bihar. It is difficult to draw any conclusion from the above analysis regarding the status of health. Less number of cases of person hospitalised in any state does not imply that the health status of the people of the state is better than that of those where cases are more. It is because that there may be possibility of not admitting the patients in the hospitals due to lack affordability of high cost treatment.



Source: NSS 60th round Unit level data, 'Morbidity, Health Care and the Condition of the Aged, Jan.-June, 2004'

Figure 10: Number (per 1000) of persons hospitalised for each broad age-groups, 2004

5.3.3 Water Related/Borne Diseases

Water related diseases adversely affect the human health and cause disability, illness or disorders and sometimes lead to death. These diseases are spread through contaminated water, which itself is caused due to the presence of micro-organisms, parasites, toxins in the

water. According to WHO, water-related diseases are those types of diseases that spread due to micro-organisms and chemicals in water which people directly use for drinking. Water may be infected or contaminated through human or animal faeces, which may contain pathogenic microorganisms. The World Health Report 2002 notes that ''About 1.7 million deaths per year worldwide are attributed to unsafe water, sanitation and hygiene, mainly through infectious Diarrhea. Nine out of ten such deaths are in children, and virtually all of the deaths are in developing countries'' (WHO 2002).

Appendix Table A 2 (refer, appendix Table A 2) demonstrates the number (per 1000) of persons hospitalised with certain specific ailments. It may be of interest to note that apart from the 'other diagnosed ailments' that account for more than 15% of the hospitalisation cases in the Ganga Basin states, in non-basin states and in all India, the proportions of cases of hospitalisation due to 'accidents/injuries/burns/fractures/poisoning' were the highest among the 'ailment types'. Other ailments with relatively high proportion of cases of hospitalisation were 'Diarrhoea/dysentery' (12% in rural and 9% in urban areas) in the Ganga basin states, 'Fever of unknown origin' (9% in rural) and 'heart disease' (8% in urban areas of the non-basin states). Further, it may be noted that 'Diarrhea/ dysentery' and 'Fever of unknown origin' both are water related diseases and on an average, both rural and urban areas are significantly affected by these two diseases. Estimates shown in the Table A2 clearly highlight that the basin states are comparatively much infected by 'Diarrhoea/ dysentery', relative to the non-basin states. It is basically Bihar and West Bengal and urban Uttar Pradesh that are significantly affected by this disease.

Box 1: Water-Related Diseases

Waterborne diseases: caused by the ingestion of water contaminated by human or animal faeces or urine containing pathogenic bacteria or viruses; include cholera, typhoid, amoebic and bacillary dysentery and other diarrheal diseases.

Water-washed diseases: caused by poor personal hygiene and skin or eye contact with contaminated water; include scabies, trachoma and flea, lice and tick-borne diseases.

Water-based diseases: caused by parasites found in intermediate organisms living in contaminated water; include dracunculiasis, schistosomiasis, and other helminths.

Water-related diseases: caused by insect vectors, especially mosquitoes, that breed in water; include dengue, filariasis, malaria, onchocerciasis, trypanosomiasis and yellow fever.

Source: Gleick, Peter H. - Dirty Water: Estimated Deaths from Water-Related Diseases 2000-2020 - Research Report, August 15, 2002 - Pacific Institute for Studies in Development, Environment, and Security

In Table A2 water related diseases are highlighted and it can be noted that these diseases have caused highest hospitalisation in the Ganga basin states as compared to the non-basin states, except in case of 'Malaria' and 'Fever of unknown origin'. This raises the question on quality of drinking water in the basin. However, some of the studies like Curtis and Cairncross (2003), and Ejemot (*et. al*., 2008) suggest that hand washing with soap, particularly after contact with excreta can reduce diarrhoeal diseases by over 40% and respiratory infections by 30%. Diarrhoea and respiratory infections are the main causes for child deaths in India. Hand washing with soap is among the most effective and inexpensive ways to prevent diarrhoeal diseases and pneumonia.

The influence of water related diseases can also be examined through number of cases of deaths, provided by National Health Profile of India (shown in Appendix Table A3). Data shown in the Table A3 reveal that:

Cholera*:* More than 25% cases of cholera were found in the basin states during 2011. Further, within the basin, 95-99% cases were found only in West Bengal.

Enteric Fever (Typhoid)*:* Most of the cases and deaths are found in the Ganga Basin states. And among the basin states, maximum cases were found in West Bengal, followed by Uttar Pradesh and Uttarakhand. Figure of Bihar are not available for this disease.

Viral Hepatitis (All Causes): Out of the total cases of viral hepatitis, 24% cases were reported in the Ganga Basin during 2009, which were the highest cases reported over the period of time since 2001. This was mainly due to the surge in number of people suffering from this disease from 10572 during 2007 to 26645 during 2009. The Ganga Basin shared about 27% of the total deaths occurred due to viral hepatitis in India (UNDP, 2006). Table A3 describes the incidence (Number of cases) and consequence (Number of deaths) occurred due to the water related diseases.

Box-2

The role of water use patterns and sewage pollution in incidence of water-borne/enteric diseases along the Ganges River in Varanasi, India

STEVE HAMNER, ANSHUMAN TRIPATHI, RAJESH KUMAR MISHRA, NIK BOUSKILL, SUSAN C. BROADAWAY, BARRY H. PYLE ,& TIMOTHY E. FORD

The overall rate of water-borne/enteric disease incidence, including acute gastrointestinal disease, cholera, dysentery, hepatitis-A, and typhoid, was estimated to be about 66% during the one-year period prior to the survey. Logistic regression analysis revealed significant associations between water borne/enteric disease occurrence and the use of the river for bathing, laundry, washing eating utensils, and brushing teeth. Thirty-three cases of cholera were identified among families exposed to washing clothing or bathing in the Ganges while no cholera cases occurred in unexposed families. Other exposure factors such as *lack of sewerage and toilets at residence*, children defecating outdoors, *poor sanitation*, low income and low education levels also showed significant associations with enteric disease outcome. This study provides an estimate of water-borne/ enteric disease incidence and identifies possible risk factors for residents who live by and use the Ganges River in Varanasi.

Consequences of water related diseases

Twater and sanitation crisis claims more lives through disease than any war claims through

Japanese Encephalitis: It is a disease caused by the mosquito-borne Japanese encephalitis virus. The percentage share of the Ganga Basin in the total cases of Japanese encephalitis occurred in India has increased significantly from 57 in 2001 to 93 in 2005. But after that the number of people suffering from this disease declined to 61% during 2011. The more cases were reported in Uttar Pradesh and West Bengal from 2001-2011 but during the same period no such cases were found in Uttarakhand. Although, number of cases has declined, however it is still one of the major disease burden affecting 5027 cases and 834 deaths due to Japanese Encephalitis in Ganga Basin during the year 2011.

Malaria: It is a mosquito- borne infectious disease of humans and other animals caused by parasitic protozoan. Commonly, the disease is transmitted via a bite from an infected female Anopheles mosquito. The proportion of people suffering from malaria was more than 9% of the total cases in country during 2011 which declined from 18% during 2003. The highest cases were reported in West Bengal (52%), followed by Uttar Pradesh (44%), Bihar (1.8%) and Uttarakhand (0.09%) during 2011 and out of the total number of deaths (16) in Ganga Basin during 2011, 14 people died in West Bengal and 2 in Uttarakhand due to Malaria, but no deaths were found in Uttar Pradesh and Bihar due to it.

Dengue: Dengue fever is also known as **breakbone fever**, is an infectious tropical disease caused by the dengue virus. The number of cases of Dengue detected in Ganga Basin during 2001 to 2011 was up to 5% of the total cases, except for 2005. In 2005, due to wide spread of Aedes albopictus in West Bengal, the number of dengue victims increased to 54% during 2005 from 5.7% during 2003 along with 34 death cases in West Bengal during the same period.

Box-3

How deadly are water borne diseases in Gorakhpur?

The Times of India: Water-borne encephalitis the new scourge in UP.

When Mahendra Kumar had a little money saved, over 10 years ago, he installed a hand pump outside his small house in Badhariya village. The first he heard of the hand pump being too shallow was when his nine-year-old daughter Saloni died of encephalitis this year and the grieving father was told it was because of the water she had drunk from the handpump. With water-borne acute encephalitis syndrome (AES) now making up close to 95% of the encephalitis cases across eastern Uttar Pradesh, there is a renewed focus on the water the area's children are drinking. "The big problem in this area is that since it is low-lying and surrounded by rivers, the water table is very high, which makes contamination easier," as per Gorakhpur's district magistrate Ravi Kumar.

6. Healthcare Expenditure and Financing

6.1 Public and Private Expenditure on Health

The current challenges in healthcare systems are related to reducing the financial burden of health care on poor households and enhance their access to quality healthcare services. The challenge is immense, as nearly 68% (Census of India, 2011) of the country's population lives in rural areas and 29.8% lives below poverty level (GOI, Planning Commission, 2012). India lacks strong healthcare infrastructure and also has several inherent weaknesses in its healthcare system. The healthcare delivery segment is dominated by the private sector which comprises about 75% share in the total healthcare market of India. India spends a little over 4% of GDP on health. Public expenditure on core health (both plan & non-plan and taking Centre and States together) was about 1.04% of GDP in 2011-12. If drinking water, sanitation, ICDS and mid-day meal are included, total public spending on health comes to 1.94% of GDP in 2011-12(GOI, 2012). Out-of-pocket expenditure on the healthcare alone comprises about two-third of total expenditure on health. Contamination of drinking water due to point and non-point sources of pollution, including open defecation increases the intensity of water bone diseases and consequently the financial burden of diseases on the households.

Table 14 shows that at the all-India level, total health expenditure from both the sources (Public and Private) has increased from Rs. 1,032,495 million in 2001-02 to Rs. 1,307,268 million during 2004-05. However, share of public sector in the total expenditure has marginally declined from 20.76 % in 2001-02 to 20.13 % in 2004-05. Further the Table shows that out of total expenditure on health in India, approximately 30% was spent in the Ganga basin states during 2001-02, which reduced to 25% in 2004-05. This reduction is because of fall in the private expenditure that contributes the major share. The share of Ganga basin in the India's total public expenditure on health, however, has increased from 17.71% in 2001-02 to 18.27% in 2004-05, while that of private sector has declined from 34.15% to 27.22% during the same years. This implies that the private expenditure on healthcare has increased faster in non-basin states of India than that in the basin states.

States within the Ganga basin also show the similar trends. For example, the proportion of Bihar in the overall health expenditure of the basin fell from 20.53% in 2001-02 to 13.70% in 2004-05 and that of Uttar Pradesh fell from 59.27% to 52.31% during the same years, while share of Uttarakhand and West Bengal in the total health expenditure of the basin has increased substantially. Although, share of private sector in the total expenditure in all states has declined in 2004-05, it still accounts for the major share in the overall expenditure on health, except in West Bengal. In Bihar, share of the private expenditure fell from 88.17% in 2001-02 to 81.85% in 2004-05, while in Uttarakhand, it went down from

92.51% to 86.88% during the same period. Contrary to this, it has increased from 76.59% to 86.28% in West Bengal during the same period.

Table 14: Public and Private Expenditure on health in Ganga Basin and India (2001-02 and 2004-05)

States	Health expenditure in (Rs. 000s)					
	2001-02			2004-05		
	Private	Public	Total	Private	Public	Total
Uttar Pradesh	174,025,330	14,088,564	188,113,894	151,006,063	22,805,122	173,811,185
% from basin	62.28%	37.10%	59.27%	53.13%	47.44%	52.31%
% from India	21.27%	6.57%	18.22%	14.46%	8.67%	13.30%
Uttarakhand	0	1,523,325	1,523,325	4,852,994	2,520,531	7,373,525
% from basin	0.00%	4.01%	0.48%	1.71%	5.24%	2.22%
% from India	0.00%	0.71%	0.15%	0.46%	0.96%	0.56%
Bihar	57,455,419	7,708,790	65,164,209	37,256,449	8,264,168	45,520,617
% from basin	20.56%	20.30%	20.53%	13.11%	17.19%	13.70%
% from India	7.02%	3.60%	6.31%	3.57%	3.14%	3.48%
West Bengal	47,924,620	14,649,483	62,574,103	91,102,485	14,485,984	105,588,469
% from basin	17.15%	38.58%	19.72%	32.05%	30.13%	31.78%
% from India	5.86%	6.83%	6.06%	8.73%	5.51%	8.08%
Ganga Basin	279,405,369	37,970,162	317,375,531	284,217,991	48,075,805	332,293,796
% from India	34.15%	17.71%	30.74%	27.22%	18.27%	25.42%
Others	538,698,663	176,420,856	715,119,519	759,917,941	215,056,328	974,974,269
% from India	65.85%	82.29%	69.26%	72.78%	81.73%	74.58%
All India	**818,104,032**	**214,391,018**	**1,032,495,050**	**1,044,135,932**	**263,132,133**	**1,307,268,065**

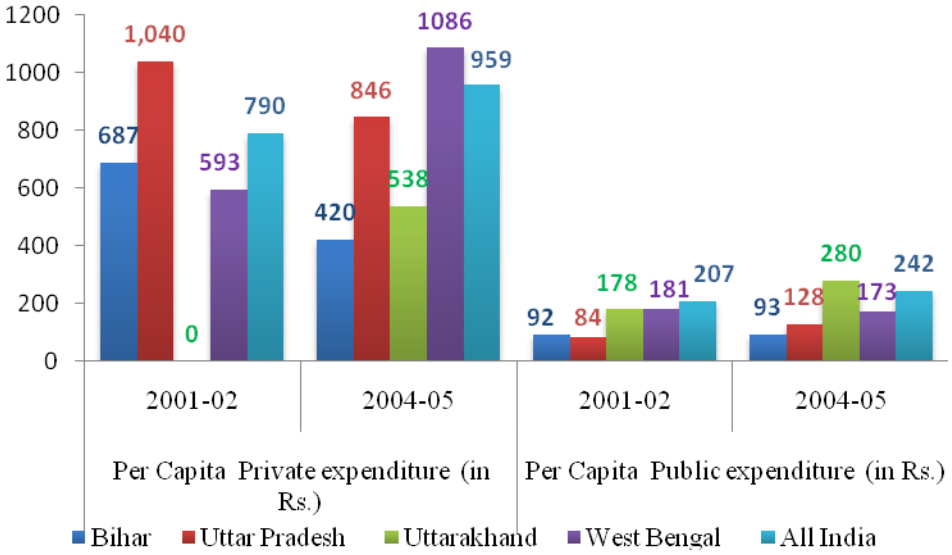
Source: National Health Accounts

Note: State-wise data do not include family planning services, health expenditure by local governments, firms and NGOs. NA-Not Available

 # All India public expenditure including expenditure by the MOHFW, Central Ministries and local bodies, while private expenditure includes health expenditure by NGOs, firms and households

Figure 11 shows that the per capita public and private health expenditure in India has increased respectively from Rs. 207 and 790 in 2001-02 to Rs. 242 and Rs.959 in 2004-05. Within the Ganga Basin states, it has increased in all the states, except West Bengal where it has actually declined. The Figure indicates that during 2001-02, per capita private expenditure on health was highest in Uttar Pradesh, followed by Bihar, while in 2004-05, it was West Bengal which had the highest per capita private expenditure on health, followed

by Uttar Pradesh. During 2001-02, per capita public expenditure on health was observed highest in West Bengal, followed by Uttar Pradesh, while in 2001-02, it was observed highest in Uttarakhand, followed by West Bengal. A perusal of Figure 11 reveals that except Uttarakhand, in all other basin states, per capita public expenditure on health was lower than the national average during 2004-05. Similarly, the per capita private expenditure on health was also observed lower in the basin states than the national average (except West Bengal) during 2004-05.



Source: National Health Accounts, M/o. Health & Family Welfare, GOI

Figure 11: Per Capita Public and Private Expenditure (in Rs.) on Health

Table 15 shows year-wise budgetary allocation on the health sector in the Ganga Basin and India. It is evident from the table that the budgetary allocation on the health sector in the basin has gone up from Rs.4908.5crores during the 10th Plan to Rs.20098.4 crores during the 11th Plan. Surprisingly, in Bihar, the allocation went down from Rs.1079.2 crores during 10th Plan to Rs. 872.5 crores during the 11th Plan, while in all other states, it has increased substantially.

Table 15: Budgetary Allocation under Health Sector during 10th and 11th Plan Period (Rs. in Lakhs)

State	Bihar	Uttar Pradesh	Uttarakhand	West Bengal	Ganga Basin	All India
10th Plan (2002-2007)	107920	240543	38767	103618	490848	2176734
2002-03	10731	25950	5769	14138	56588	297061
2003-04	12343	19746	6315	18585	56989	3560112
2004-05	14390	38353	9979	15392	78113	400876
2005-06	16318	19746	6303	18590	60957	389402
2006-07	13700	188763	18600	44290	265353	767639

Table continued to next page … … …

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State	Bihar	Uttar Pradesh	Uttarakhand	West Bengal	Ganga Basin	All India
11th Plan (2007-12)	87254	1319405	214882	388301	2009842	6103802
2007-08	25706	149360	26519	31840	233425	832364
2008-09	11283.	184739	16546	43056	255625	1038282
2009-10	14009	168324	15202	56608	254143	1254179
2010-11	19500	152913	30310	68435	271158.	1578558.
2011-12	54450	204964	42376	87385	389174	2075451

Source: National Health Profile of India Reports (2005-2011)

Table 16 shows the year-wise share of the basin states in the total budgetary allocation on health in India. The table reveals that the percentage share of the basin states in the total budgetary allocation for the health sector during the last decade ranges from 15.65% to 34.57%. The percentage varies significantly across years and does not evince any trend. Within the basin, highest budgetary allocation towards health sector was made in Uttar Pradesh, followed by West Bengal. It is observed from the table that during the 11th Plan, the proportion of budgetary allocation towards the health sector for Bihar and Uttarakhand is somewhat similar, although these two states are highly distinctive in respect of socio-economic and demographic indicators. For example, 53.5% of the population in Bihar was below poverty line in 2009-10, whereas the corresponding percentage in Uttarakhand was only 18 (Planning Commission, 2012). Further, more than 75% of the Bihar households did not have toilet facility at homes in 2011; while the corresponding percentage in Uttarakhand was only 34. Also, 58% of household in Bihar had 'no drainage' in 2011, while percentage of such households in Uttarakhand was only 39.

Table 16: Proportion from All India Budgetary Allocation Under Health Sector (10th and 11th Plan)

Years	Bihar	Uttar Pradesh	Uttarakhand	West Bengal	Ganga Basin
2002-03	3.61%	8.74%	1.94%	4.76%	19.05%
2003-04	3.47%	5.55%	1.77%	5.22%	16.01%
2004-05	3.59%	9.57%	2.49%	3.84%	19.49%
2005-06	4.19%	5.07%	1.62%	4.77%	15.65%
2006-07	1.78%	24.59%	2.42%	5.77%	34.57%
2007-08	3.09%	17.94%	3.19%	3.83%	28.04%
2008-09	1.09%	17.79%	1.59%	4.15%	24.62%
2009-10	1.12%	13.42%	1.21%	4.51%	20.26%
2010-11	1.24%	9.69%	1.92%	4.34%	17.18%
2011-12	2.62%	9.88%	2.04%	4.21%	18.75%

Source: National Health Profile of India Reports (2005-2011)

6.2 Sources of Healthcare Financing

6.2.1 Medical Treatment Expenditure for non-hospitalised treatment

As per 60th NSS round, a person was considered to have medical treatment if he/she had consulted a doctor anywhere (in OPD of a hospital, community health centre, primary health centre/sub-centre, dispensary, doctor's chamber, private residence, etc.) and obtained medical advice on his/her ailment. Medical treatment expenditure includes allopathic, homeopathic, ayurvedic, unani, hakimi or some other recognized system. Treatment taken on the basis of medical advice/prescription of a doctor obtained earlier for similar ailment(s) was also considered as medical treatment. But, self-doctoring was not considered as treatment.

Total expenditure incurred for medical treatment received during the reference period (15 days for non-hospitalised treatment and 365 days for hospitalised treatment) included expenditure on items like bed charges (with charges for food included in it), medicines (including drips), materials for bandage, plaster, etc., fees for the services of medical and paramedical personnel charges, for diagnostic tests, operations and therapies charges of ambulance costs of oxygen, blood, etc. All other types of expenditure incurred for treatment, such as lodging charges of escort, attendant charges, cost of transport other than ambulance, and cost of personal medical appliances, were excluded from medical expenditure.

Table 17 provides the average medical expenditure by source of treatment and other related non-medical expenditure per treated person during a period of 15 days for the rural and urban areas of the basin states and India. It may be noted that the estimates given in the table pertain only to the non-hospitalised treatment of ailments. It is seen that the average total expenditure per treated ailment was Rs.285 and Rs.326 in rural and urban areas, respectively, at the all India level. However, the total expenditure per treated ailment varied widely across the states of Ganga Basin. In the rural areas, it ranged from Rs.225 in West Bengal to Rs. 551 in Uttarakhand, and in the urban areas, from Rs.266 in Uttarakhand to Rs. 372 in Bihar. Interestingly, contrary to what was observed for most of the states as well as for the country as a whole, Uttar Pradesh, and Uttarakhand within Ganga basin reported a higher medical expenditure per treated ailment in the rural areas than in the urban areas.

The total medical expenditure has been divided into two parts – the part paid to the government sources and the other to the private sources for availing the total service for treatment of the ailment. At all India level, average medical expenditure for treatment in 2004-05 was higher in urban areas (Rs. 306) than in the rural areas (Rs. 257). Further, it is also observed that the share of private sources in total medical expenditure was higher in urban than rural areas of India. Within the Basin states, the medical expenditure per treated ailment in rural areas was observed highest in Uttarakhand, followed by Uttar Pradesh and

Bihar, while in urban areas, it was almost similar in Uttar Pradesh, Bihar and West Bengal (ranging from Rs.301 to Rs.303) and much lower in Uttarakhand (Rs.250). It can be concluded from the analysis of data shown in the table that almost all medical expenditure per treated patient during 15 days was sourced to the private sector. The share of government sources was negligible. However, share of government sources was relatively higher in the lower Ganga basin (Bihar and West Bengal) than the other stretches of the basin. Other expenditure, such as, transport, escort of patient, etc was observed highest in Uttarakhand, followed by Bihar and Uttar Pradesh in rural areas , while in urban areas, it was found highest in Bihar, followed by Uttar Pradesh and West Bengal. The share of other expenditure in the total expenditure incurred due to illness ranged from 7.4% in Uttar Pradesh to 18% in Uttarakhand in rural areas and 5.6% in Uttarakhand to 14.8% in Bihar in urban areas. On an average, rural people spent more amount of money on transport, escort, lodging, etc., related to the patient treatment than their urban counterparts.

Often ailment of a working member of the household causes loss of household income. Ailment of a non-working member too causes disturbance of usual activity of the working member of the household, which, in turn, results in loss of household income. According to NSS report, for the persons getting pay, either as regular salaried employee or casual labour, the amount of loss in income during the period of treatment was derived on the basis of pay that he/she was drawing before the hospitalisation/ailment; for the self-employed persons, it was imputed based on the proportionate average income (lost) during those days. For non-ailing members of the household who could not carry out their 'work' (economic activity) in order to attend to the ailing member, the loss of income for them, if any, was derived in the same manner and was also included in the loss of income of the household. An estimate of loss of household income per treated person gives an idea about the total burden on the household due to treatment of ailment.

As Table 17 indicates, the loss of household income was observed highest in Bihar (Rs. 585), followed by Uttar Pradesh (Rs. 152) in the rural areas. This was much higher than the all India estimate of Rs. 135. In urban areas also, the loss was estimated to be highest in Bihar (Rs. 150), followed by Uttar Pradesh (Rs. 117), and West Bengal (Rs.77). Thus, prevention of morbidly would not only reduce the burden of medical expenditure on the households but also help to reduce the loss of productivity in the economy. It is also significant to note that loss of household income per treated person in rural areas of poor state Bihar was even higher than the actual expenditure on treatment.

Table 17: Average medical and other related non-medical expenditure per treated person during 15 days by source of treatment (in Rs.)

	Medical expenditure by source of treatment			other expenditure	Total expenditure	Loss of household income per treated person
	Govt.	Pvt.	all			
Rural						
Uttarakhand	0	452	453	98	551	51
Uttar Pradesh	10	326	336	27	363	152
Bihar	42	263	305	47	351	585
West Bengal	20	187	207	17	225	98
India	11	246	257	27	285	135
Urban						
Uttarakhand	0	250	250	15	266	16
Uttar Pradesh	9	303	312	22	334	117
Bihar	14	303	317	55	372	150
West Bengal	5	301	306	19	325	77
India	7	299	306	20	326	96

6.2.2 Medical Expenditure for Hospitalised Treatment

According to 60th round of NSS (2004), a person is considered hospitalised if he/she had availed of medical services as an indoor patient in any hospital. Hospital, for the purpose of survey, referred to any medical institution having provision for admission of sick persons as indoor patients (inpatients) for treatment. Hospitals covered public hospitals, community health centres and primary health centers (if provided with beds), ESI hospitals, private hospitals, nursing homes, etc. In this context, it may be noted that admission for treatment of ailment and discharge thereof from the hospital was considered as case of hospitalisation irrespective of the duration of stay in the hospital. It may also be noted that hospitalisation in the cases of normal pregnancy and childbirth were treated as hospitalisation cases.

Further, the expenditure for hospitalised treatment on items such as doctor's fees, bed charges, and cost of medicines and other materials and services supplied by the hospital, as well as charges for diagnostic tests done at the hospital, were included in medical expenditure. The 'other expenses' relating to hospitalised treatment is the same as that for non-medical treatments. The estimates of 'total expenditure' for hospitalised treatment were arrived at as the sum of 'medical expenditure' and 'other expenditure'.

Table 18: Average medical and other related non-medical expenditure per hospitalised person during 365 days by source of treatment (in Rs.)

	Medical Expenditure by source of treatment			other expenditure	total expenditure	loss of household income per treated person
	Govt.	Pvt.	all			
Rural						
Uttarakhand	5,166	12,544	9,486	1,245	10,731	1,224
Uttar Pradesh	7,648	9,169	8,765	652	9,417	920
Bihar	4,998	6,949	6,655	758	7,413	1,008
West Bengal	2,464	10,339	4,149	433	4,582	386
India	3,238	7,408	5,695	530	6,225	636
Urban						
Uttarakhand	4,083	19,861	14,925	513	15,438	450
Uttar Pradesh	5,144	10,351	8,907	342	9,250	536
Bihar	30,822	11,807	14,674	1,033	15,708	1,566
West Bengal	4,312	16,025	8,715	510	9,224	529
India	3,877	11,553	8,851	516	9,367	745

Table 18 gives the estimates of average total, medical expenditure incurred and loss of household income per hospitalised case of treatment during the reference period of 365 days. It can be seen that both the average total expenditure and the medical expenditure per hospitalisation case were almost 1.5 times higher in the urban areas than in the rural areas of India. The table also indicates the presence of a wide deviation across the states of Ganga Basin in respect of average total expenditure incurred per hospitalisation. In the rural areas, it varied from Rs. 4,582 in West Bengal to Rs. 10,731 in Uttarakhand, and in the urban areas, from Rs.9,224 in West Bengal to Rs. 15,438 in Bihar. Interestingly, contrary to what is observed for most of the states as well as for the country as a whole, Uttar Pradesh reported a higher average expenditure per hospitalisation in the rural areas than in the urban areas. Table 18 also shows that in all the Basin states, per hospitalized person expenditure was much lower in government than the private hospitals. In urban areas also, per hospitalized person expenditure was lower in government than private hospital, except for Bihar where the expenditure in Government hospital was higher than in the private hospital. This may be due to some outlier cases in the sample which might have affected the average expenditure. Other expenditure was observed highest in Uttarakhand, followed by Bihar and Uttar Pradesh in rural areas and Bihar, followed by Uttarakhand in Urban areas.

As far as loss of wages/income of household per treated person is concerned, it was observed highest in Uttarakhand (Rs.1224) and lowest in West Bengal (Rs.386) in rural areas; while in urban areas it was found highest in Bihar (Rs.1566) and lowest in Uttarakhand (Rs.450

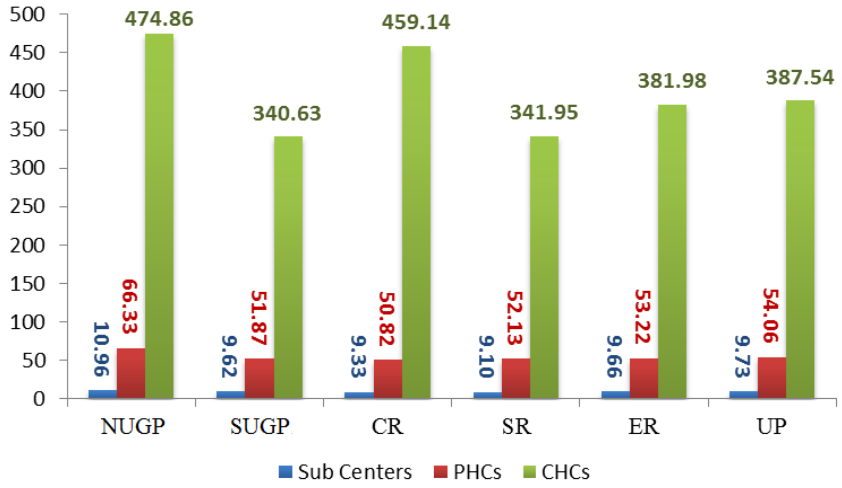
PART II: Disaggregated Analysis

In this section, we have made disaggregated (district-wise/region-wise) analysis of data related to healthcare infrastructure, water, sanitation and other health related aspects. Since Uttar Pradesh is very large in size of area and population, it has been divided into five regions for the analysis purpose. All districts of West Bengal and Bihar, however, were bifurcated into River Bank and Non- River Bank districts.

7. Health Care Infrastructure

7.1 Service Infrastructure

Figure 12 shows the region-wise number of persons served per sub-centre, PHC, and CHC in Uttar Pradesh. According to the norms prescribed in the RHS bulletin (2012), a sub-centre is expected to serve 5000 persons in plain areas and 3000 persons in hilly areas but in Uttar Pradesh, one sub centre was serving more than 9000 persons in all the regions. The number of persons served per sub-centre was observed highest in NUGP, followed by the ER and SUGP. Similarly, an average PHC in all the regions of the state was found to serve number of persons more than the norm (more than 30 thousand). The number was estimated to be highest in NUGP (66.33 thousand) and lowest in CR (50.82 thousand). In case of CHC also, the number of persons served was much higher than the norm (1.20 lakh). Figure 12 shows that the number of persons served per CHC was found highest (474.86 thousand) in the NUGP, followed by CR (459.14 thousand) and ER (381.98 thousand). It can be inferred from the perusal of the Figure that the public healthcare infrastructure in all the regions of the state is quite inadequate to meet the requirement of the population.

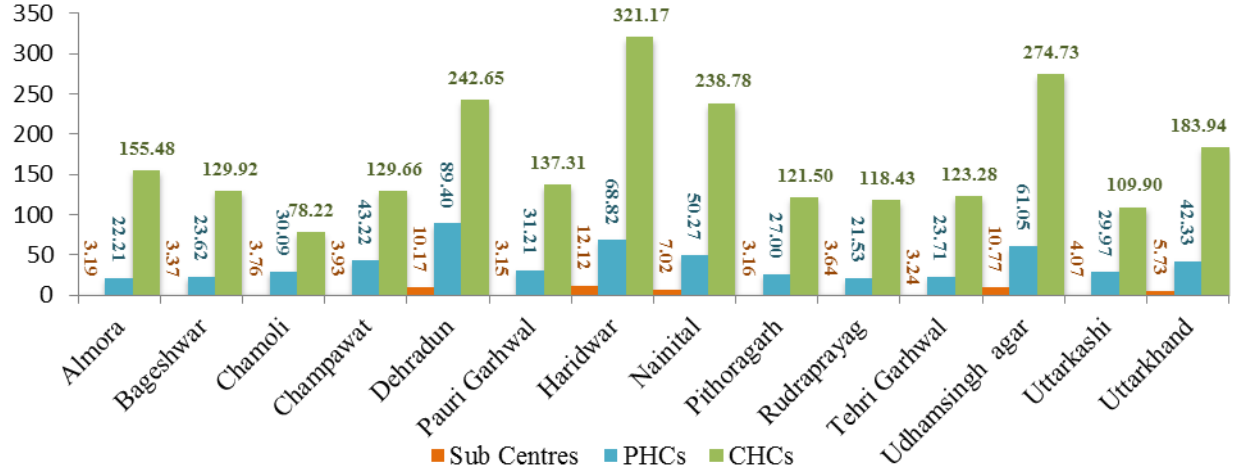


Source: RHS Bulletin (2011) & Census of India (2011)

Figure 12: Region-wise Population ('000) served per Sub-centre, PHC, CHC in Uttar Pradesh, 2011

Figure 13 shows district-wise number of persons served per sub-centre/PHC/CHC in Uttarakhand in 2011. The Figure depicts that an average sub-centre in the districts of plain/semi-plain areas of the state (Dehradun, US Nagar, Haridwar and Nainital) served

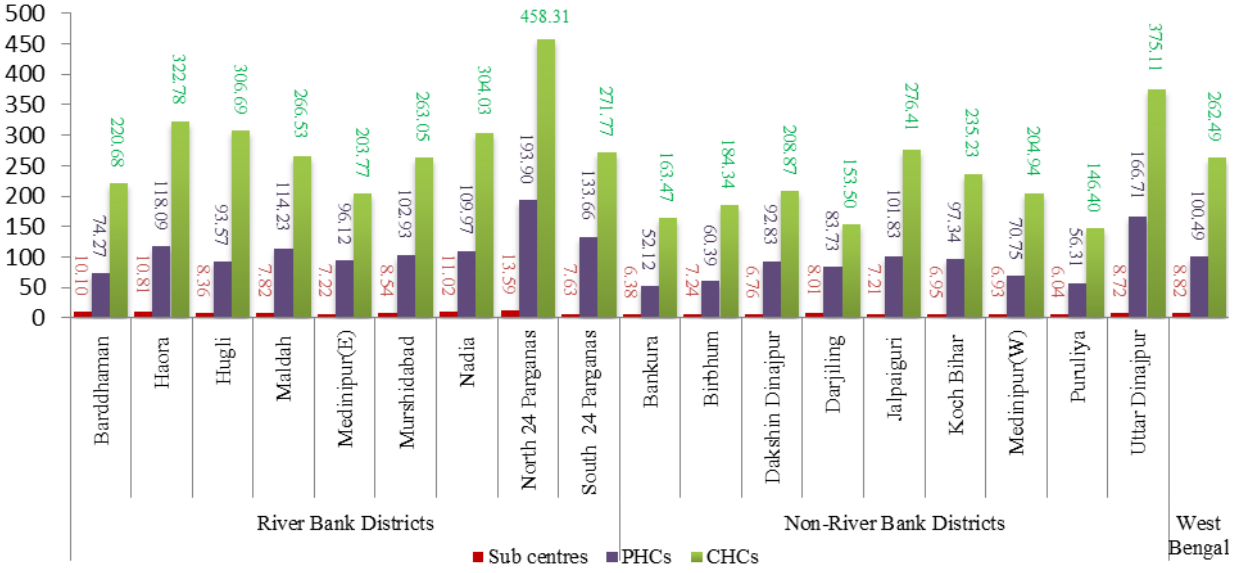
more number of people than that in the districts of hill areas of the state. For instance, as against 12.12 thousand persons served by a sub-centre in Haridwar, an average sub-centre in Pauri Garhwal served only 3.15 thousand persons. It is evident from the Figure that an average sub-centre in the plain areas served 7-12 thousand persons, while in the hilly areas, it served only 3 to 4 thousand persons in 2011. The same trend has been observed in case of persons served by an average PHC. For example, as against 89.40 thousand persons served in Dehradun, a PHC in Rudraprayag served only 21.53 thousand persons. The Figure also shows that the number of persons served per CHC was highest in Haridwar (321.17 thousand), followed by U S Nagar (274.73 thousand), Dehradun (242.65 thousand) and Nainital (238.78 thousand). The number was found lowest in Chamoli (78.22 thousand), followed by Uttarkashi (109.90 thousand) and Rudraprayag (118.43 thousand).



Source: RHS Bulletin (2011) & Census of India (2011)

Figure 13: District-wise Population ('000) Served per Sub-centre, PHC, CHC in Uttarakhand, 2011

For West Bengal, it is found that undoubtedly in the river bank districts more persons were served per sub-centre, PHC, CHC in comparison with the non-river bank districts. Among the river bank districts, sub-centre, PHC and CHC in North 24 Parganas, district served 13.59 thousand, 193.90 thousand and 458.31 thousand persons, respectively, followed by Nadia (11.02 thousand persons per sub-centre, 109.97 thousand persons per PHC and 304.03 thousand persons per CHC) and Howrah (10.81 thousand persons per sub-centre, 118.09 thousand persons per PHC and 322.78 thousand persons per CHC). Among non-river bank districts, Uttar Dinajpur covered more population of 8.72 thousand per sub centre, 166.71 thousand per PHC and 375.11 thousand per CHC as compared to other districts of the state during 2011 (Figure 14). In West Bengal also, the public healthcare infrastructure was quite insufficient to meet the requirement as number of persons served per sub-centre/PHC/CHC were higher than the set norms.



Source: RHS Bulletin (2011) & Census of India (2011)

Figure 14: District-wise Population ('000) Served per Sub-centre, PHC, CHC in West Bengal, 2011

Figure 14a portrays the population served per Sub-centre, PHC and CHC in Bihar during 2011. In Bihar the situation of CHC was more alarming for Bank districts than non-bank districts as 1665.04 thousand population was served per CHC instead of 120 thousand according to set norms in the state during 2011. One sub-centre was serving 10.78 thousand persons in Bank districts and 10.67 thousand persons in non-bank districts and one PHC was providing healthcare to more population in Bank districts (59.36 thousand) as compared to non-bank districts (54.03 thousand) during 2011. A district-wise detail is given in Appendix Table A4.

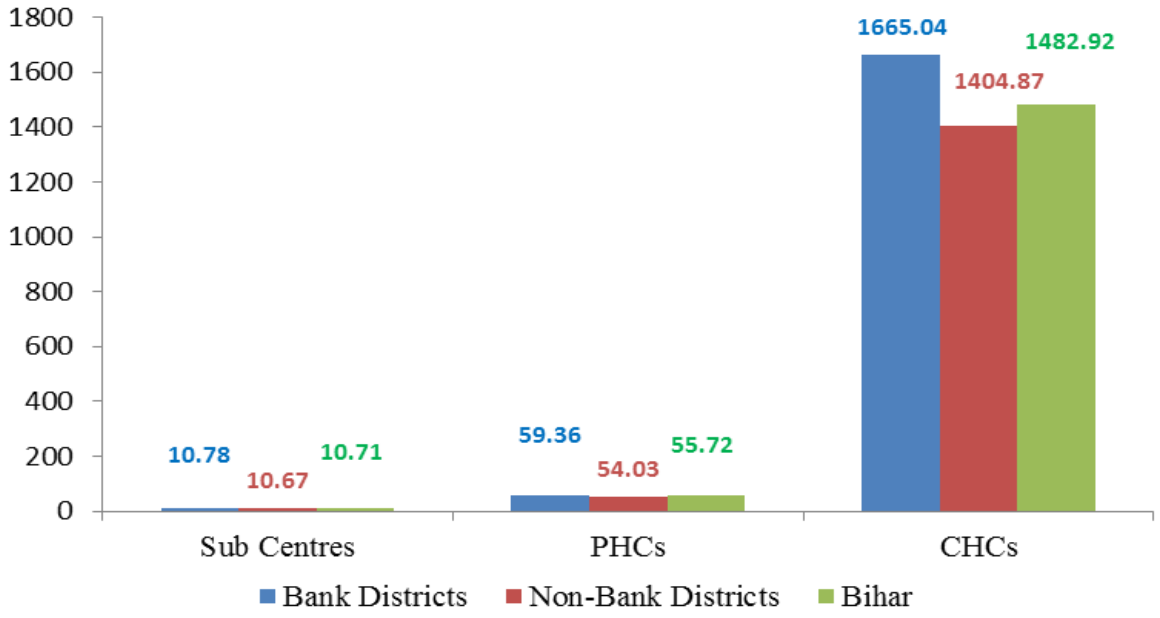


Figure 14a: District-wise Population ('000) served per Sub-centre PHC, CHC in Bihar, 2011

7.2 Educational Infrastructure

Appendix Table A5 shows the number of existing private and government medical colleges along with number of beds in the attached hospitals in Uttar Pradesh during 2011. Table A5 reveals that there were total 25 medical colleges in Uttar Pradesh and among all the districts, Lucknow tops the list as it had one government and 2 private medical colleges with 3900 beds in attached hospitals in 2011. Except Lucknow and Meerut, there were no other districts in the state where both government as well as private medical colleges were established. It is also observed that the numbers of medical colleges are not evenly distributed across districts. Only 20 districts of the state have medical colleges.

Table 19 shows that in Uttarakhand, there were only 2 government medical colleges (one in Nainital and other in Pauri Garhwal) and 2 private medical colleges (Dehradun). The total capacity of the medical colleges of the Uttarakhand was 2350 beds in 2011.

Table 19: Medical Colleges in Uttarakhand with Number of Beds (2011)

District/city/town	Government	Private	No. of Beds in Attached Hospital
Nainital	1	0	600
Dehradun	0	2	1450
P. Garhwal	1	0	300
Uttarakhand	2	2	2350

Source: National Health Profile, 2011

As far as number of medical colleges in West Bengal is concerned, Table 20 shows that out of total 14 medical colleges (12 government and 2 private), 50% were established only in the capital city of Kolkata, with about one-third of total number of hospital beds of the state. Several cities and towns of the state did not have any medical college.

Table 20: Medical Colleges in West Bengal with Number of Beds (2011)

District/city/town	Government	Private	No. of Beds in Attached Hospital
Bankura	1	0	1217
Burdwan	1	0	NA
Kolkata	6	1	1966
Purba Medinipur		1	500
Paschim Medinipur	1		561
Maldah	1		600
Nadia	1	0	440
Darjeeling	1		599
West Bengal	**12**	**2**	**5883**

Source: National Health Profile, 2011

In Bihar, there were 10 medical colleges (7 government and 3 private colleges) functioning during 2011 (Table 21). These colleges had a capacity of 6160 hospital beds. Among 8 districts which are equipped with educational infrastructure, Patna has the highest number of medical colleges (3) and all the colleges are government colleges. Other districts are having only one medical college either government or private during 2011.

Table 21: Medical Colleges in Bihar with no of Beds (2011)

District/city/town	Government	Private	No. of Beds in Attached Hospital
Patna	3	0	2927
Gaya	1	0	544
Lakhisarai	1	0	1030
Bhagalpur	1	0	659
Kisanganj	0	1	NA
Katihar	0	1	NA
Saran	0	1	500
Muzaffarpur	1	0	500
Bihar	**7**	**3**	**6160**

Source: National Health Profile, 2011

8. Water, Sanitation and Health

This section examines district-wise/region-wise households' access to drinking water and sanitation and burden of diseases in the Ganga Basin states.

8.1 Drinking Water

Figure 15 shows the distribution of households by main sources of drinking water in Uttarakhand. Uttarakhand is blessed with rich sources of water. Rivers like Ganga and Yamuna originate and flow through Uttarakhand. As per the Census 2001 the state is ranked 6th in availability of safe drinking water. In Uttarakhand, tap water is the main source of drinking water in all the districts (except Haridwar and U S Nagar). Further, percentage share of Tap water has increased in 2011 over 2001. Except Haridwar and US Nagar districts, in all other districts, share of tap water ranges from 65 to 88 percent. Districts located in the hill region have relatively higher proportion of households using tap water than their counterparts in the plain districts. In plain districts, particularly, Haridwar and US Nagar, hand pump was the main source of drinking water (54.05% in Haridwar and 58.46% in US Nagar in 2011). Households in the state also had tank/pond /lake, river/canal, spring etc. as sources of drinking water; however, their share in the total was quite low, except for other source in a few districts of hill areas. A comparison of households distributed by sources of

drinking water in Census 2001 to that of Census 2011 shows that there has been improvement in the access of safe drinking water to the households.

Figure 16 shows that about 56% of households in Uttar Pradesh used hand pump as a source of drinking water. The proportion of households using hand pump as a source was observed highest in SR (71.64%), followed by ER (66.82%), SUGP (66.08) and CR (64.96%). Next to hand pump is tap water which constituted 27.26% of total households of the State, with highest proportion in NUGP (36.71%) and lowest in SR (17.36%).

Figure 17 for West Bengal reveals that it was mostly the hand pumps in all the districts and tap water especially in Kolkata, which served as the main sources of drinking water. Now hand pumps mostly dealing with ground water very often face crisis when the water quality is highly contaminated with chemicals substances. Particularly in West Bengal, greater tendency to cultivate Boro variety of rice leads to usage of more fertilizer and more insecticide along with greater water usage. The used chemicals seep down into the surface water as well as ground water, thus contaminating them. Again more water consumptions lead to rapid use of shallow pumps in summer leading to fall in the natural ground water level and chances of contamination of poisonous substances like Arsenic. Currently in West Bengal most of the areas under river bank districts like Nadia, North 24 Parganas, Murshidabad & Maldah and some parts of Hooghly and South 24 Parganas are highly affected with Arsenic contaminated ground water. A natural query arises here is to probe the propensity of people to go for purification and filtration process for drinking water purpose, because hand pump usage is still high in West Bengal. Murshidabad and Nadia are the two major arsenic hit districts, respectively source 77% and 67% of drinking water from hand pumps.

The Figure 18 portrays that in Bihar Like Uttar Pradesh and West Bengal, hand pump is the major source of drinking water as 89% of total households are using hand pump water for drinking followed by tap water (4%) and well water (4%) during 2011. In Non-Bank districts of the state use of Hand Pumps (89%) was higher than that in the Bank districts (82%). Due the use of more Hand Pumps people in Bihar are more prone to use of ground water which is very much contaiminated in the state and thus are exposed to diseases.

The water collected by a household for drinking is sometimes not consumed directly but only after some cleaning/treatment. Prior cleaning/treatment of water before drinking is good indicator of health awareness which is clearly demonstrated in Figure 19. According to this in Uttarakhand, 79.05% of the households are using Tap water after treatment in 2011. And only 20.95% of households are using untreated tap water. More than 70% households are using treated tap water in all the districts (except Bageshwar). Dehradun is the most conscious about health and safe drinking water as about 91.12 % households are using treated tap water for drinking purposes.

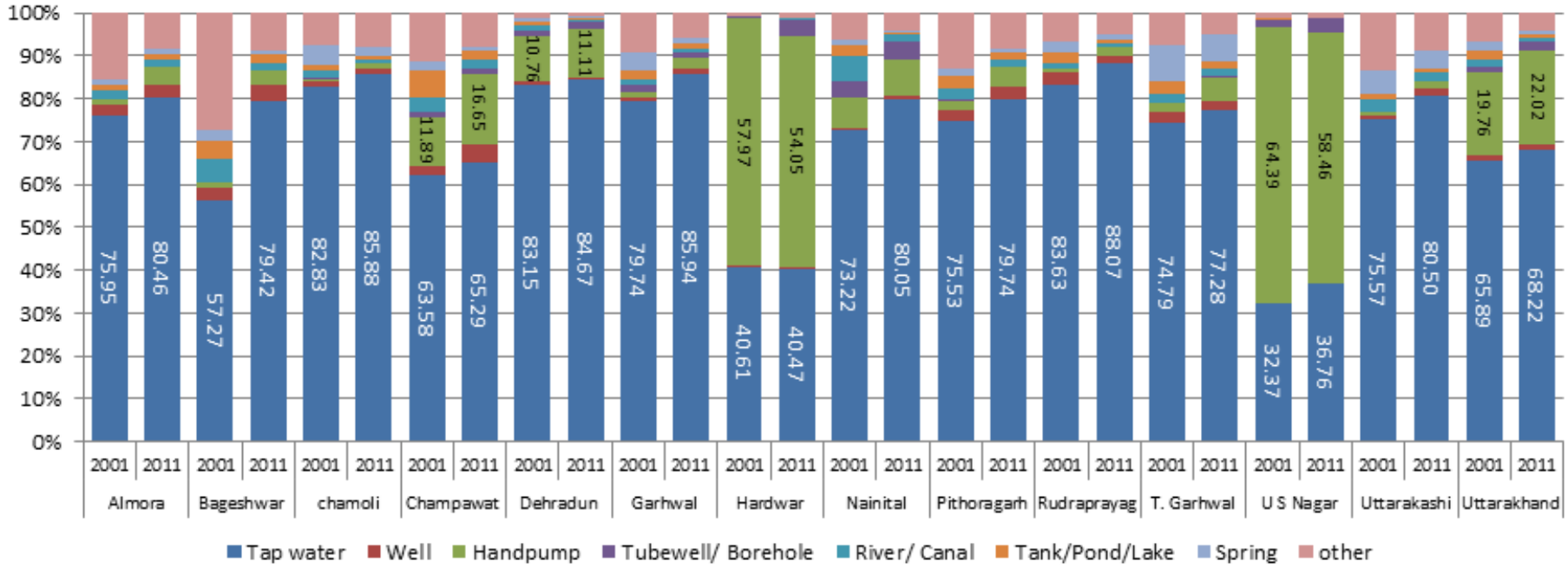


Figure 15: Distribution of Households by Main sources of Drinking water, Uttarakhand (2011)

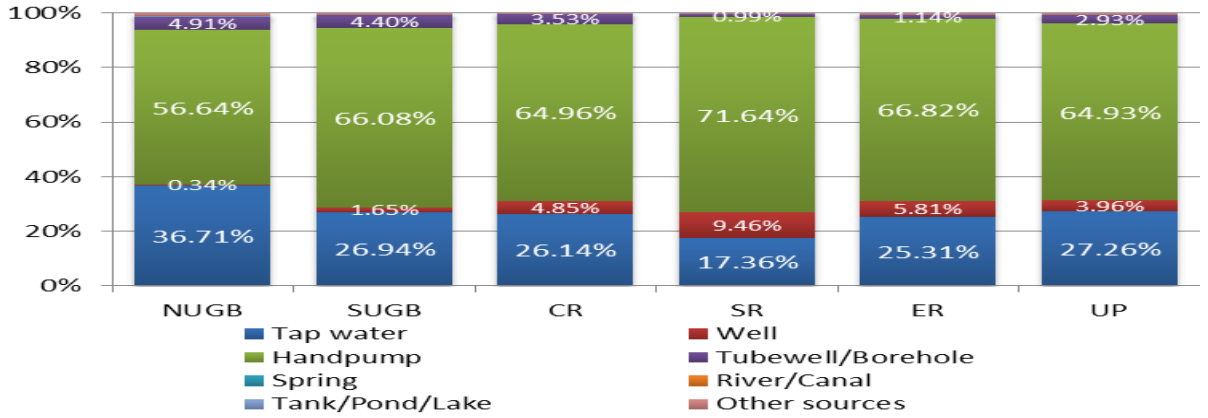


Figure 16: Distribution of Households by Main sources of Drinking water, Uttar Pradesh (2011)

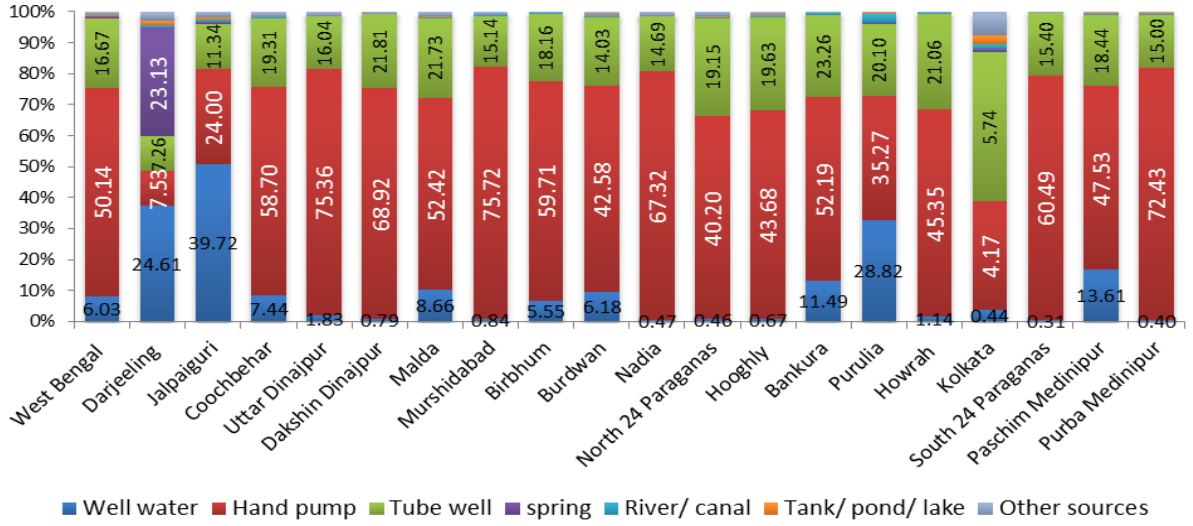


Figure 17: Distribution of Households by sources of Drinking water in West Bengal, 2011

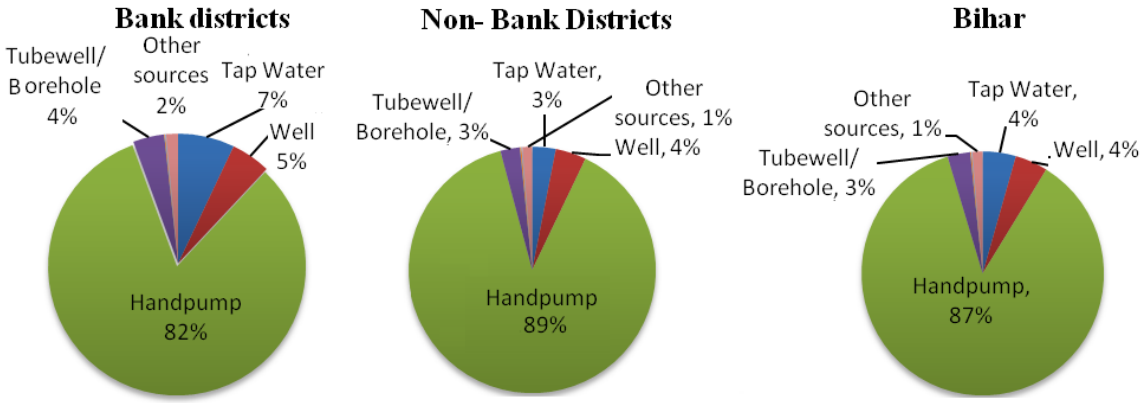


Figure 18: Distribution of Households by sources of Drinking water in Bihar, 2011

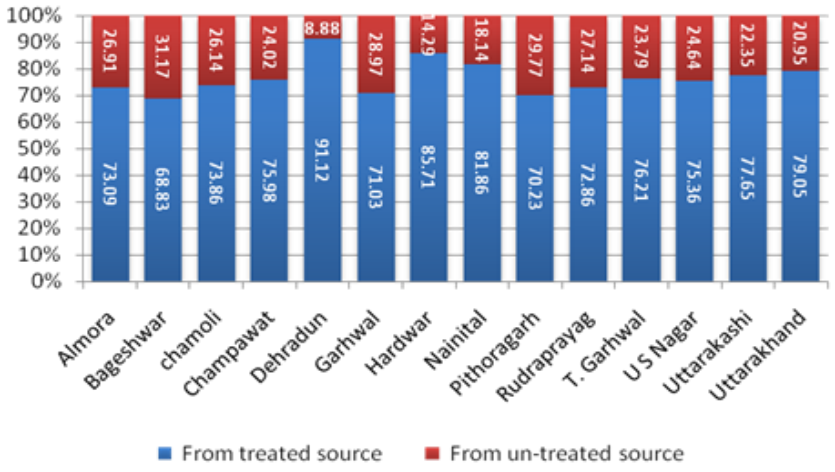
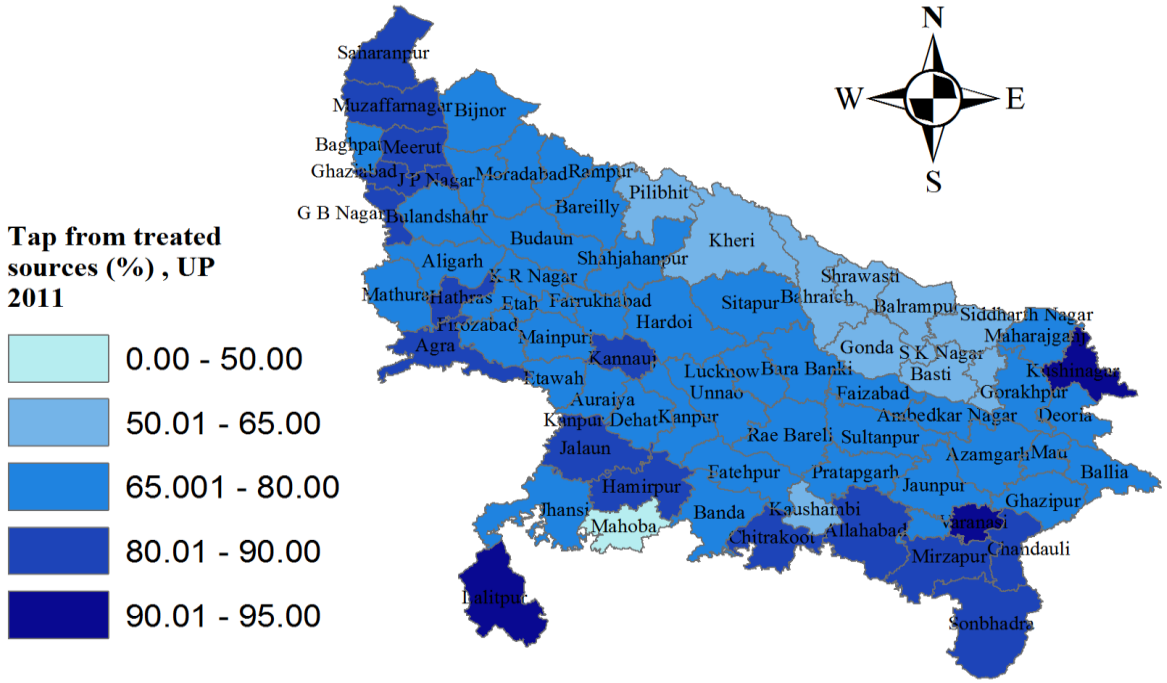


Figure 19: Distribution of Households by sources of Tap Water in Uttarakhand, 2011

Map 6 shows that more than 50% households in Uttar Pradesh were using tap water from treated sources. However, percentage of such households varies significantly across districts. In most of the districts, 65-80% of households were reported to use tap water from treated sources. Only in 10 districts, percentage of such households was less than 50. Laitpur, Varanasi and Kushinagar districts had the highest proportion of households (90-95%) using tap water from treated sources..



Source: Census of India (Uttar Pradesh), 2011.

Map 6: Distribution of Households by sources of Tap Water (treated) in Uttar Pradesh, 2011

The Figure 20 shows the percentage distribution of households using treated and untreated tap water across districts of West Bengal. About 50% households in districts like Coochbehar, Darjeeling and Bankura received tap water from untreated sources. However the river bank

districts have relatively higher proportion of households using treated tap water, except for Maldah, Murshidabad, Nadia and Purba Medinipur where 26.95%, 28.40%, 29.45% and 25.69% of households, respectively used untreated tap water. Nadia stands in the worse situation given the intensity of ground water contamination and water pollution.

Figure 21 shows the percentage distribution of households using tap water from treated and untreated sources in Bihar. As is obvious from the Figure, Bank district had slightly higher percentage of households using tap water from the treated sources than the non-bank districts.

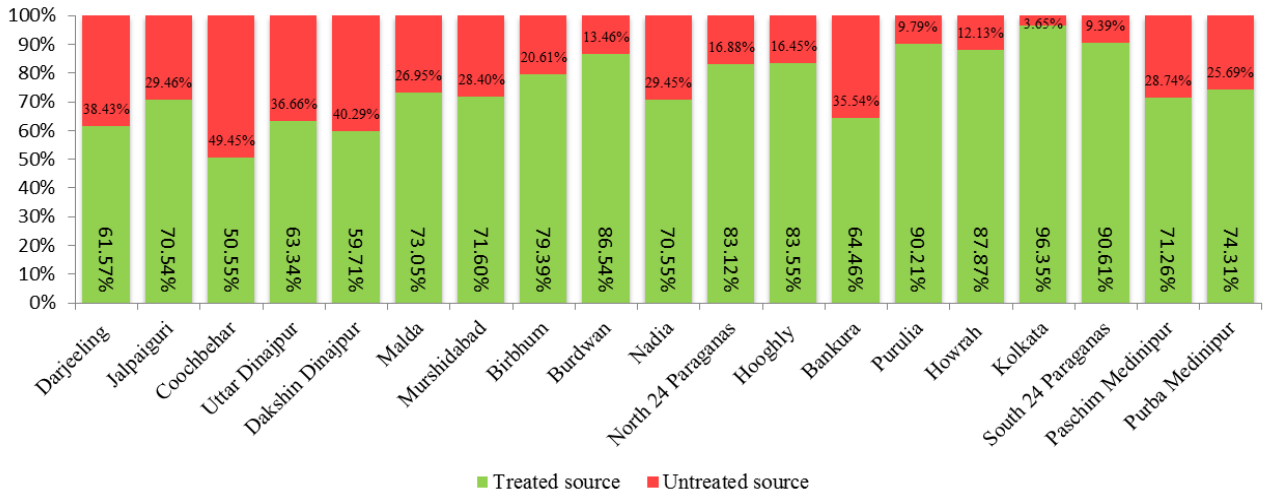


Figure 20: Distribution of Households by sources of Tap Water (treated) in West Bengal, 2011

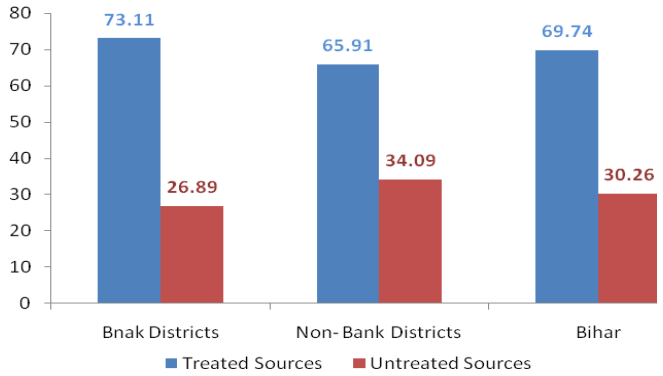


Figure 21: Distribution of Percentage of Households using Tap water from treated and Untreated Source in Bihar, 2011

8.1.1 Purified Water and its Sources

Table 22 shows that Uttar Pradesh, the most populated states of the country, has just 7 households per 1000 in rural and 47 households per 1000 in urban areas that have used some kind of treatment process for drinking water. Region-wise analysis shows that number of households per 1000 treating water before drinking in urban areas was highest in ER (82), closely followed by CR (81) and SUGP (74), while in rural areas, the number was highest in SR (26), followed by SUGP (18) and ER (14). R-O is considered scientific method of water purification. The percentage share of households using R-Os for water purification was much higher in urban than rural areas in all the regions, except ER where proportion of rural households using R-O was higher than their urban counterparts. Similarly, rural households of NUGP and SUGP were found to using 'other than listed processes', whereas in rural SR, cloth screen and in rural CR and ER, filtration were commonly used to clean the drinking water.

Table 22 : Proportion of households treating water before drinking and per 1000 distribution of such households by type of water treatment, Uttar Pradesh (2004)

Region	Sectors	Ultra-violet/ resin/reverse osmosis	Filter	Boiling	Cloth screen	Any disinfectant	Others	No. per 1000 Treating water Before drinking
NUGP	Rural	0.00%	9.56%	8.13%	0.00%	0.00%	82.31%	6
	Urban	20.96%	4.68%	65.06%	0.00%	8.58%	0.72%	58
SUGP	Rural	0.00%	41.43%	0.00%	0.00%	0.00%	58.57%	18
	Urban	23.39%	13.47%	42.80%	11.26%	4.87%	4.21%	74
CR	Rural	7.55%	72.74%	19.71%	0.00%	0.00%	0.00%	13
	Urban	0.48%	23.58%	64.22%	0.32%	6.19%	5.20%	81
SR	Rural	0.00%	0.00%	2.12%	58.09%	4.57%	35.23%	26
	Urban	0.00%	0.00%	13.79%	81.58%	0.00%	4.63%	66
ER	Rural	27.46%	45.28%	15.92%	0.00%	0.00%	11.33%	14
	Urban	15.47%	3.76%	80.78%	0.00%	0.00%	0.00%	82
UP	Rural	13.66%	40.59%	11.44%	8.75%	0.69%	24.87%	7
	Urban	12.96%	11.72%	57.68%	8.87%	5.74%	3.03%	47

Source: NSS 60th round Unit level data, 'Morbidity, Health Care and the Condition of the Aged, Jan.-June, 2004

The NSS 60th round (2004) does not provide sufficient district-wise estimates for comparing rural and urban areas of Uttarakhand in this respect. For urban areas, six districts and for rural areas only one district, that is., Haridwar was evaluated to analyses the proportion of households treating water before drinking during 2004 as shown in Appendix Table A6. One district cannot possibly explain the real situation of overall rural Uttarakhand, therefore only urban Uttarakhand is considered for the analysis. Overall, about 30% of urban households used any method of purification of drinking water. Most of these households used boiling and filtration as the main sources of treatment of drinking water, except in urban Dehradun where more than 30% of such households used 'Ultra-violet/resin/reverse osmosis' types of

techniques for water purification. At the state level, only about 6% of households who treated drinking water, used RO. However, the percentage of such households varies significantly across districts. The proportion of urban households using RO was reported to be highest in Dehradun, followed by Haridwar.

As far as proportion of households treating water before its use in Bihar is concerned, Appendix Table A7 reveals that a majority of households in the state did not treat water before its use. At the state level, only 6.3% of urban households and 0.30% of rural households used any purifying method. The highest number of such households in urban areas were found in Munger district (182 per 1000), followed by Muzzafarpur district (182 per 1000) and Saran district (161 per 1000). Except one rural household in Vaishali district, all other districts, not even a single household was found to use R-O to clean drinking water.

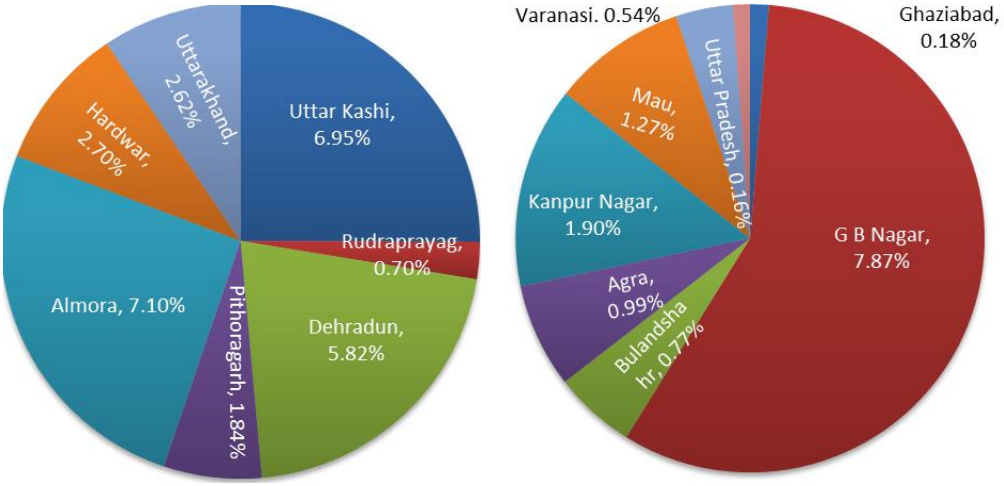
In West Bengal 188 urban households and 35 rural households per 1000 used water purification before its use. In urban areas, number of households treating water before use per 1000 was found highest in Medinipur district (366), followed by Bankura District (324) and Murshidabad (304). In rural areas, it was observed to be highest in Bankura (125), followed by Howrah (94) and Jalpaiguri (61). On an average, in urban areas, filter was the most common method used for water purification. Among those using treated water, the highest percentage in urban areas was of filter (72.22%), followed by RO (16.20%), whereas in rural areas, the highest percentage was of boiling (29.75%), followed by Filter (25.33%) and cloth screen (21.46%). A perusal of Table A8 reveals that percentage distribution of households using different methods of water treatment varies significantly across districts and rural-urban location. In case of RO, the percentage was higher in urban than in rural areas. The highest percentage of households using RO in urban areas was observed in Kolkata (33.29%), followed by Howrah (17.36%), Hugli (17.02%) and North 24 Parganas (14.53%). In more than 50% districts of the state, urban households did not use RO to clean the drinking water. In rural areas, except for a few districts, in all other districts, RO was not used by the households to purify the drinking water.

8.1.2 Bottled Water

Failure to provide municipal supply often affects the poorest populations either by leaving them to pay the inflated prices for water provided by private vendors or shifting them to use unhygienic sources of water. As per the 60th NSS Round (2004-05), in Uttarakhand (refer, Figure 22-a), some households in 6 out of 13 districts were using bottled water as a source of drinking water. The proportion of such households was highest in Almora district (7.10%), followed by Uttarkashi (6.95%), Dehradun (5.82%), Haridwar (2.70%), and Pithoragarh (1.84%).

In Uttar Pradesh, bottled water was not reported to be used in all the districts. As per the 60th round, households only in 7 districts of the state (refer, Figure 22-b) have reported to

use bottled water. These districts with the percentage of households using bottled water out of total number of households, shown in brackets are: G B Nagar (7.87%), Kanpur Nagar (1.90%), Mau (1.27%), Agra (0.99%), Bulandshahr (0.77%), Varanasi (0.54%) and Ghaziabad (0.18%). Poor quality of drinking water sources and rising income of households could be the main reasons for the use of 'Water Bottles' as a source of drinking water.

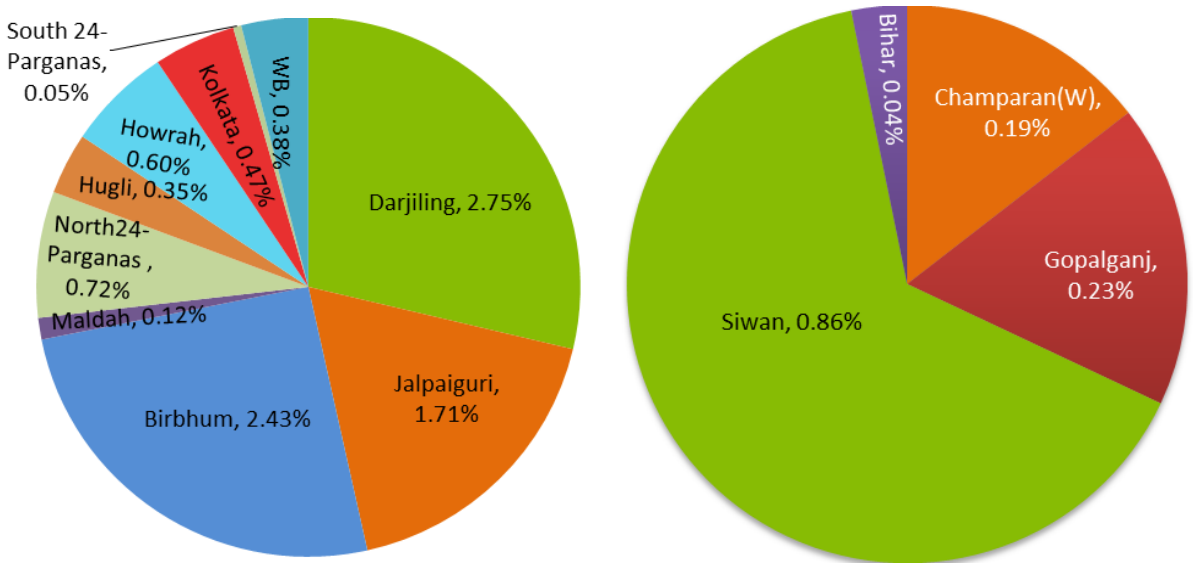


UTTARAKHAND **UTTAR PRADESH**

Source: NSS unit level data 60th round 'MORBIDITY AND HEALTH CARE', 2004

Figure 22 (a, b) : Proportion of Households having 'Water Bottles' as Sources of Drinking water within Uttarakhand and Uttar Pradesh, 2004

In West Bengal (Refer, Figure 23-a), bottled water is used as a source of drinking in 9 out of total 18 districts. Among all the households using bottled water, highest share was of Darjiling (2.75%), followed by Birbhum (2.43%) and Jalpaiguri(1.71%). Households only in three districts of Bihar (Refer, Figure 23-b) were using Bottled water for drinking. Among these districts, Siwan (0.86%) occupies highest proportion, of households using bottled water, followed by Gopalganj (0.23%) and West Champaran (0.19%). A point to note is that only in rural ares of Bihar, households with source of drinking water as 'Bottled water' were found. None of the urban households of Bihar was found of using Bottled water as a source of drinking water.



WEST BENGAL **BIHAR**

Source: NSS unit level data 60th round 'MORBIDITY AND HEALTH CARE', 2004

Figure 23 (a, b) : Proportion of Households having 'Water Bottles' as Sources of Drinking water within West Bengal and Bihar, 2004

8.2 Access to Toilets

Figure 24 shows that in all the regions of Uttar Pradesh, percentage of households without toilet facilities has declined in 2011 over 2001, however considering the extent of the problem the decline can be termed as marginal. For instance in most of the regions the decline was only 1% to 3% except for NUGP where it was 10% and SR where it was a distant 5.3%. Notwithstanding the declines, it is clear that UP has a long long way to go since households without access to toilet is over 60%. Among various regions, ER with deficit of 78% ranks highest follwed by SR at 69%, CR at 65% and SUGP at 63%. WR (NUGP + SUGP) offers encouraging situation where the deficit in 2011is reported to be about 32%.

Figure 25 illustrates the distribution of households categorised by main source of toilets across districts of Uttarakhand. The Figure reveals that in all the districts of Uttarakhand, there has been an increase in sanitation coverage, or to put in other words, decline in proportion of households not having any access to toilet facilities within the premises in 2011 over 2001. Dehradun ranked first in terms of access to toilet facilities within the premise in 2011. It is followed by Nainital, U S Nagar and Haridwar. The decline in the proportion of households without toilets is significant in almost all the districts in 2011 over 2001, with highest decline recorded in Bageshwar (30%), followed by Rudraprayag (26.60%). However, there are still several areas where coverage is low e.g., Uttarkashi with 56.27% households and Champawat with 53.63% households without access to toilets.

Figure 26 presents sanitation deficit in West Bengal as per which it emerges that apart from Kolkata, all other districts suffer from lack of proper household latrine facilities. The only

other better performing districts are North 24 Parganas and Purba Medinipur. A apart from these districts, all other districts have acute shortage of latrine facilities. Bankura with deficit of 80% and Purulia with 90% represent the lowest ranking districts in West Bengal.

Distribution of households by main sources of latrine in Bihar in 2011 is shown in Appendix Table A9. Among 'bank districts', proportion of households having 'no latrine' varies from 47% in Patna to 83% in Katihar; whereas among the 'non-bank districts', this proportion varies from 69% in Nalanda to 91% in Araria. While no correlation can be drawn based on location of districts, it is evident that all across the state the satus of sanitation coverage is rather dismal and there are serious issues with environmental sanitation and public health.

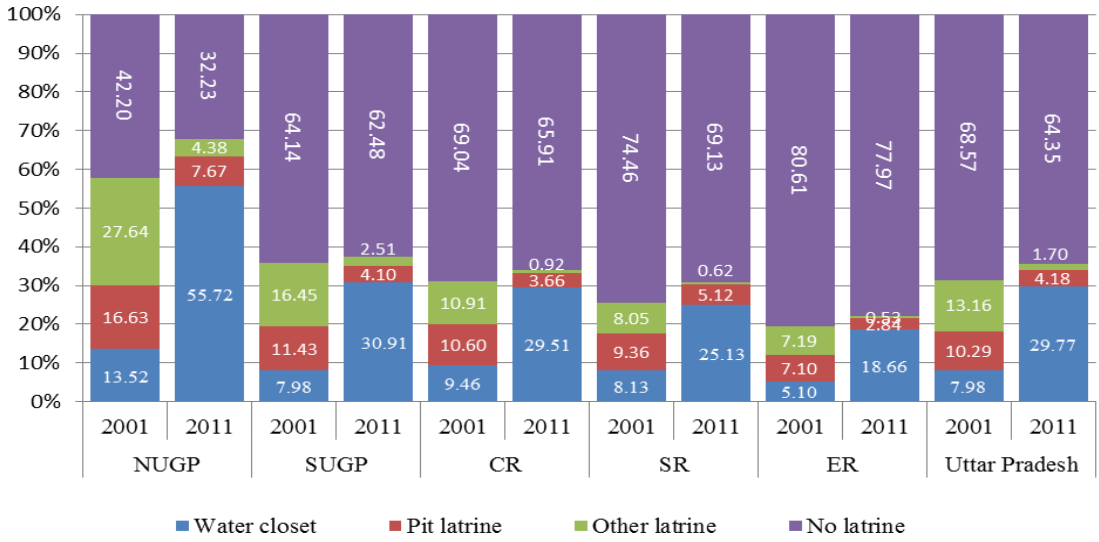


Figure 24: Distribution of Households by Main Sources of Latrine, Uttar Pradesh

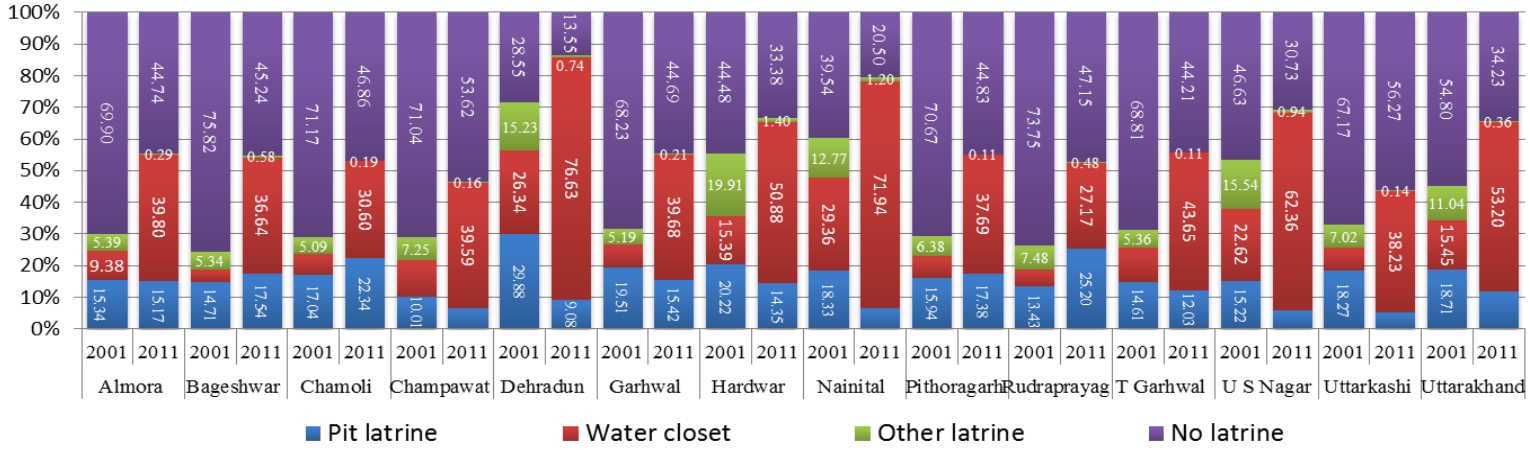


Figure 25: Distribution of Households by Main sources of Latrine, Uttarakhand

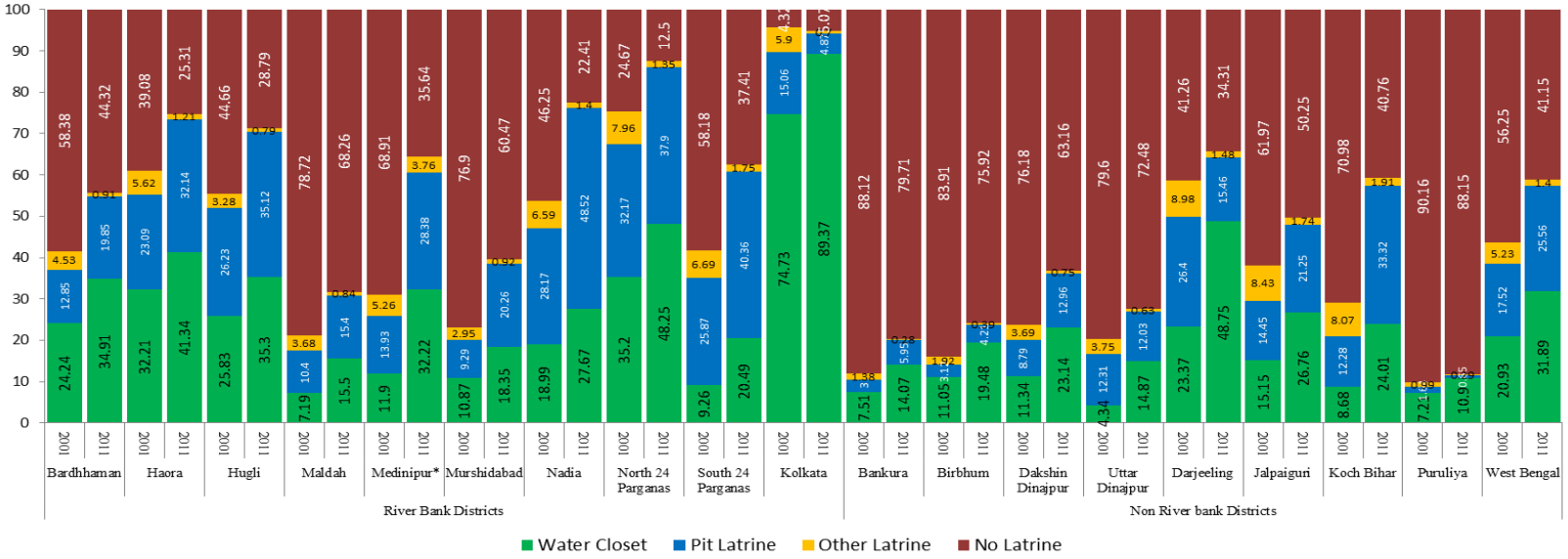


Figure 26: Distribution of Households by Main Sources of Latrine, West Bengal

8.3 Sewerage and Drainage Facilities

As shwon in Figure 27, in 9 out of 13 districts in Uttarakhand, more than 50% of the households did not possess any drainage system in 2011. These districts are Pithoragarh, Pauri Garhwal, Uttarkashi, Rudraprayag, Tehri Garhwal, Chamoli, Champawat, Almora and Bageshwar. This represents severe limitation of municipal infrastructure and also indicates challenges on account of, among others, topography and poor resource allocation.

Figure 28 shows regional distribution of households by types of drainage facilities in Uttar Pradesh. On this count the situation appears to be worse in lower part of Uttar Pradesh i.e., ER and SR where according to the Census 2011 more than 50% and 35% households respectively did not possess any dainage system.

Figure 29 depicts drainage scenario in West Bengal which brings out a rather dismal picture almost across the entire state except for Kolkata. It is noted that even in highly industrialised districts of North 24 Parganas, Howrah and Hooghly households without proper drainage/sewerage were 50%, 60% and 58% respectively which shows reliance on either on-site sanitation or open defecation and indiscriminate disposal of sullage .

In Bihar, the proportion of 'no drainage' households varies from 20% in Rohtas to 86% in Kisanganj during 2011 (Figure 30). Drainage situation in Bihar can be critical because of generally impervious soil leading to longer periods of stagnation of water and consequent offering of breeding sites for disease vectors such as mosquitoes.

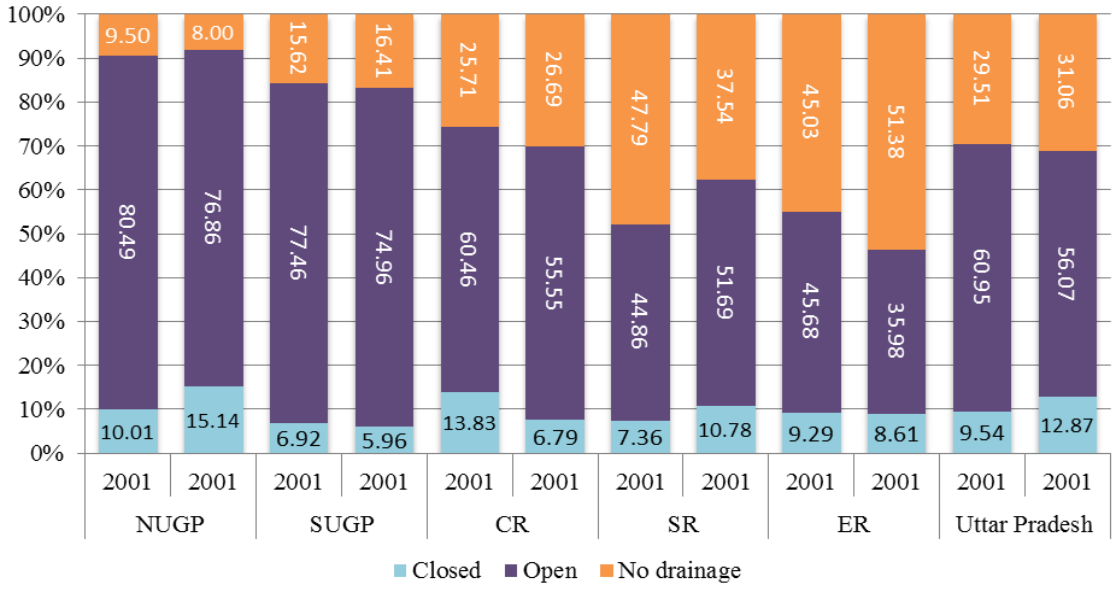


Figure 27: Region-wise Distribution of Households by Types of Drainage in Uttar Pradesh

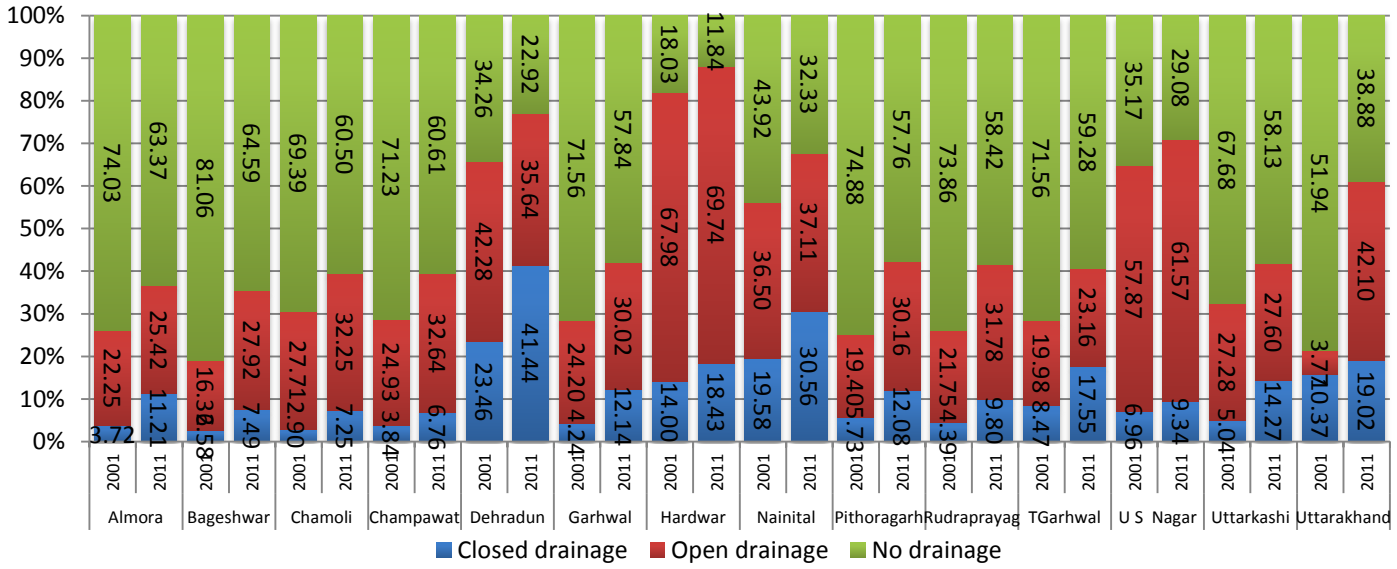


Figure 28: Distribution of Households by Main Types of Drainage in Uttarakhand

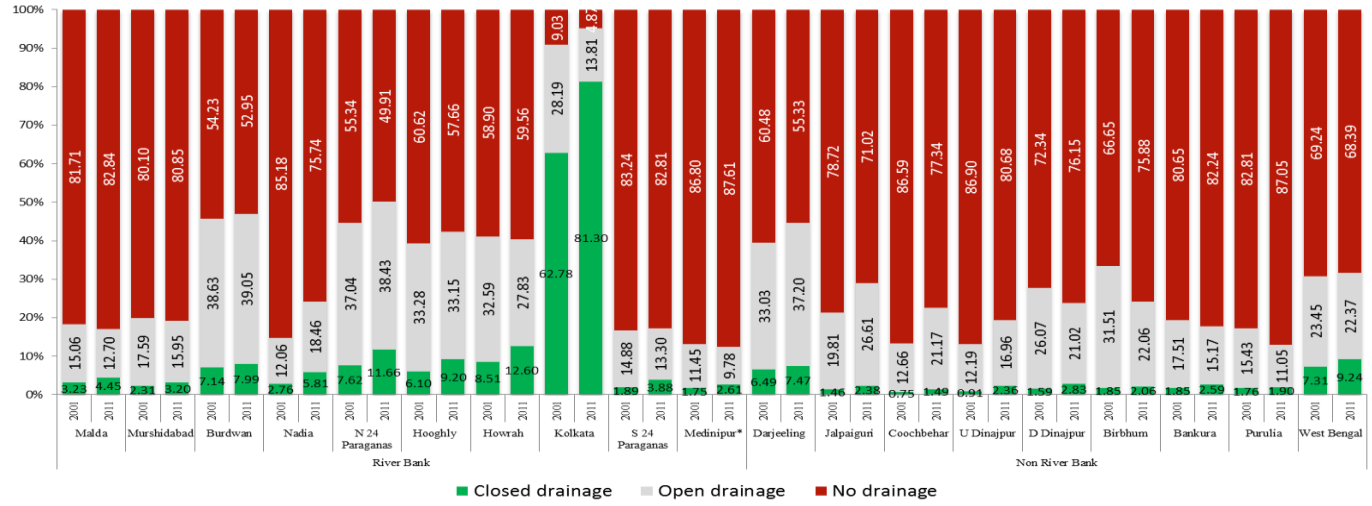


Figure 29: Distribution of Households by Main Types of Drainage in West Bengal

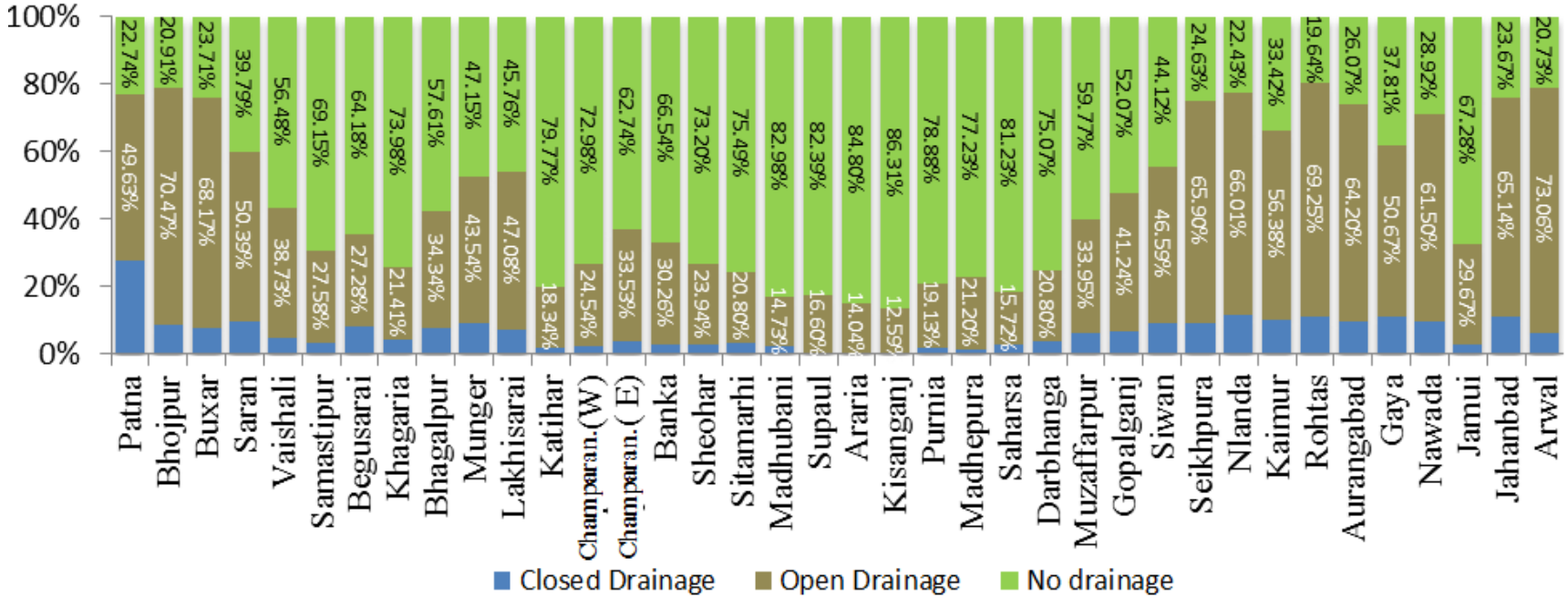
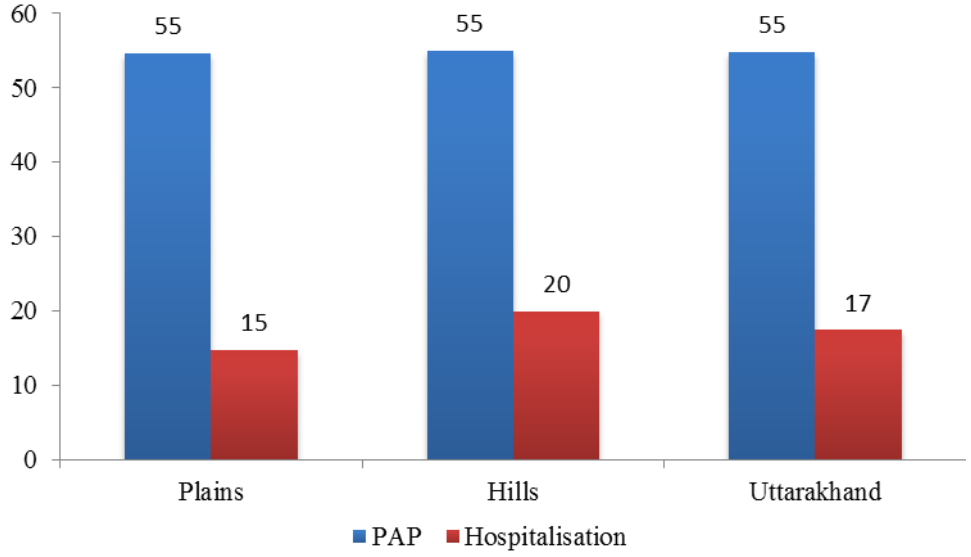


Figure 30: Distribution of Households by Main Types of Drainage in Bihar (2011)

8.4 Morbidity

8.4.1 General Morbidity by Proportion of Ailing Persons (PAP) and Number (per 1000) of Persons Hospitalised

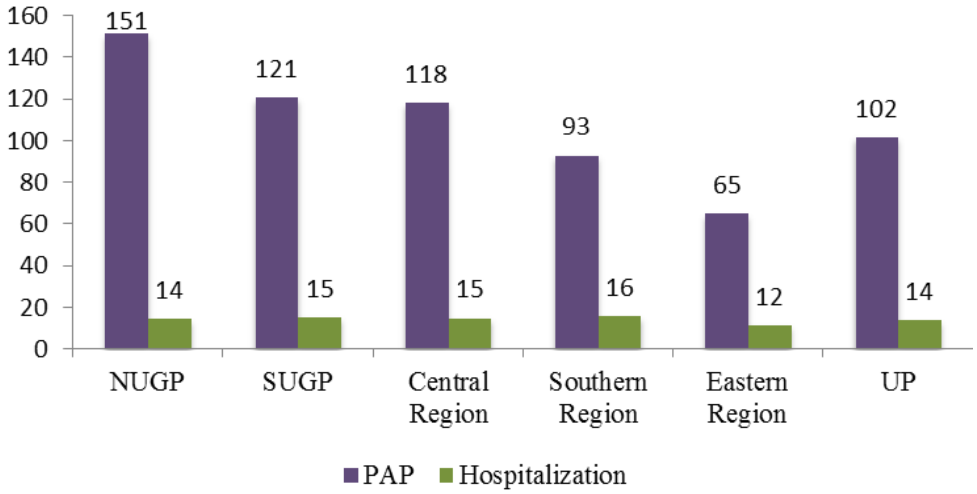
Figure 31 presents estimates on prevalence of morbidity in terms of Proportion of Ailing Persons (PAP) and Number of Persons Hospitalised (per 1000) in Uttarakhand. The PAPs estimate for overall Uttarakhand (including plains and hills) stands at 55 per 1000 persons. However, the number of persons hospitalized (per 1000) is found to be more in hills (22 per 1000) than in plains (15 per 1000) during 2004. Relatively poorer health in hill districts could be attributed to generally poor sanitation coverage and drainage infrastructure.



Source: NSS 60th round Unit level data, 'Morbidity, Health Care and the Condition of the Aged, Jan.-June, 2004'

Figure 31: Number (per 1000) of persons reporting ailment (PAP) during a period of 15 days and Number (per 1000) of persons hospitalised during 365 days in Uttarakhand, 2004

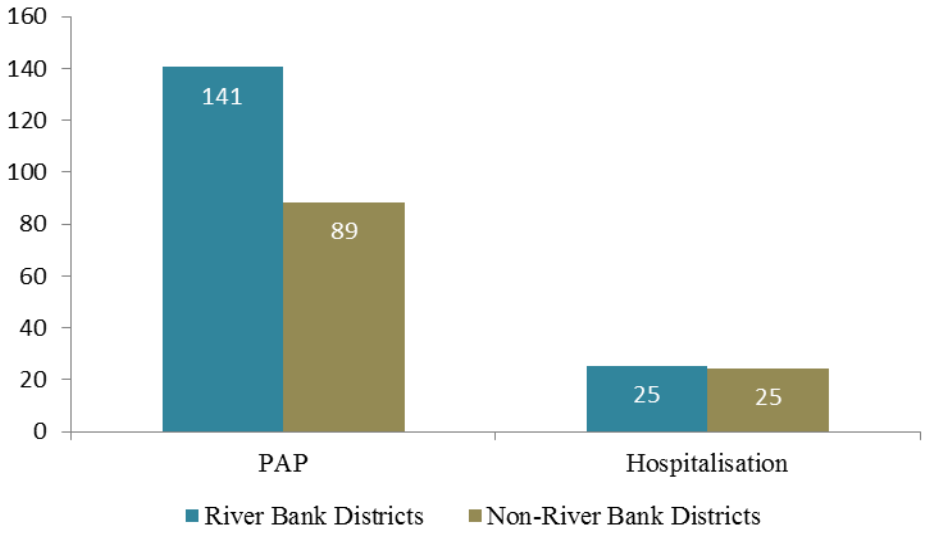
Figure 32 presents PAP and hospitalisation pattern across regions in UP in 2004. NUGP with PAP of 151 per 1000 was found to be highest while eastern region reported lowest at 65 per 1000. In NUGP 85% of the households had either open drainage or no drainage facility, 42% households were devoid of latrine facility and 56% households were using hand-pumps as a source of drinking water during 2011. Poor infrastructure and sanitation coverage coupled with the pressure of industrialisation and urbanisation in Western Uttar Pradesh (NUGP + SUGP) could be attributed to higher incidence of ailments.



Source: NSS 60th round Unit level data, 'Morbidity, Health Care and the Condition of the Aged, Jan.-June, 2004'

Figure 32: Number (per 1000) of persons reporting ailment (PAP) during a period of 15 days and Number (per 1000) of persons hospitalised during 365 days in Uttar Pradesh, 2004

Figure 33 presents PAP and hospitalisation pattern in West Bengal where there is a striking difference in ailments between 'river bank' and 'non-river bank' districts – the latter reporitng lower incidence than the former. It is noteworthy that in comparison to Uttarakhand PAP rates in UP and West Bengal are found to be significantly high, while the latter two are quite comparable.

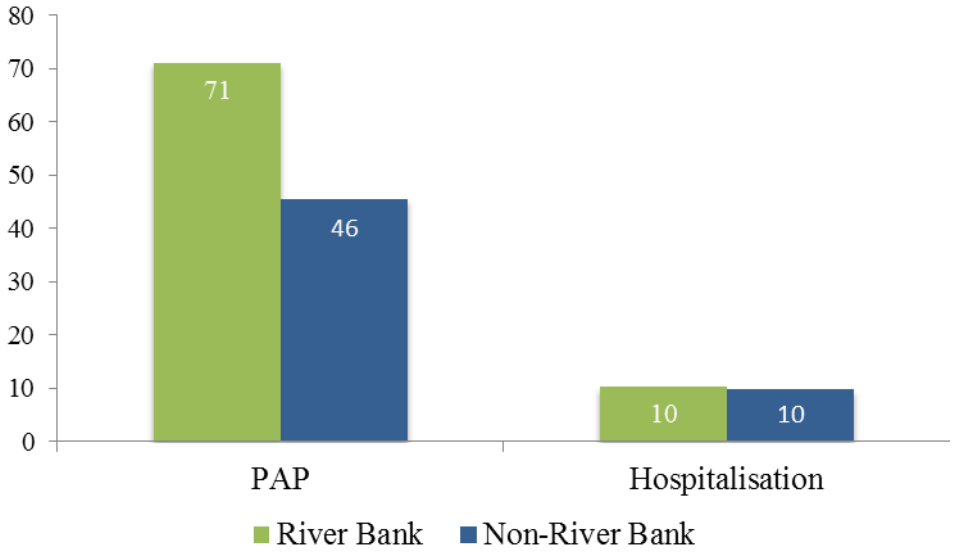


Source: NSS 60th round Unit level data, 'Morbidity, Health Care and the Condition of the Aged, Jan.-June, 2004'

Figure 33: Number (per 1000) of persons reporting ailment (PAP) during a period of 15 days and Number (per 1000) of persons hospitalised during 365 days in West Bengal, 2004

As shown in Figure 34 in Bihar also PAP was found lower in 'non-river bank' districts compared to 'river bank' districts. Interestingly PAP rate in non-river bank districts of Bihar is found to be even better than what is reported all across Uttarakhand.

With rather limited information on causative factors it is difficult to draw conclusions, but one trait that appears to be emerging is that with lower level of urbanisation, industrialisation and lower pressure of population lesser number of people have been reporting ailments. Besides water and sanitation, possibly the less stressful lifystyle and fresher air could also be contributing to lower level of ailments in Uttarakhand and parts of Bihar.



Source: NSS 60th round Unit level data, 'Morbidity, Health Care and the Condition of the Aged, Jan.-June, 2004'

Figure 34: Number (per 1000) of persons reporting ailment (PAP) during a period of 15 days and Number (per 1000) of persons hospitalised during 365 days in Bihar, 2004

9. Conclusions and Policy Implications

India spends a little over 4% of GDP on health. Public expenditure on health (both plan & non-plan and taking Centre and States together) consisted of 1.04% of GDP in 2011-12 (GOI, 2012). Private sector constitutes about 75% of total healthcare expenditure in India. Out-of-pocket expenditure alone comprised about two-third of total expenditure on health. Contamination of drinking water due to point and non-point sources of pollution, including open defecation increase incidence of water borne diseases. Diarrhoeal diseases are the second leading cause of death among children under five years of age. Economically marginalized people suffer more due to contaminated water and poor sanitation and hygiene conditions as they cannot afford to buy costly water purifiers and other sanitary

and hygiene related facilities. Therefore, preventive measures can be more cost effective than the curative measures as these measures would ensure better health of the people and also prevent loss of productivity and missed educational opportunity that may occur due to morbidity among the workers and school going children. Human Development Report 2006 recognizes that 'water and sanitation are the most powerful preventive medicines available to governments to reduce the rate of infectious diseases'. About 1.5 million children under five years, which die every year in India due to water-borne diseases, could be saved if quality of water, sanitation and hygiene are improved. It is in this context that this study has been carried out to examine three inter-related issues—water, sanitation and health—in the Ganga basin and attempts to link the access to safe drinking water and sanitation facilities, including type of toilets and drainage facility with the intensity of water-related and water-borne diseases. Key Findings of the study are summarized in the following points:

9.1 Summary of Findings and Conclusions

1. Overall health profile was found better in West Bengal and Uttarakhand than Uttar Pradesh and Bihar, which may be attributed to better public healthcare infrastructure in these states.
2. Public healthcare infrastructure in the Ganga Basin states was inadequate to meet the requirement. On an average, the actual number of sub-centres, PHCs and CHCs in position met only 65%, 63%, and 37% of the requirement, respectively in 2012. Among the basin states, Bihar shows alarming situation in terms of deficit in healthcare infrastructure.
3. In India, about 44% of households use tap water as source of drinking water, while corresponding percentage in the Ganga Basin is only 22%. In the Ganga Basin, hand pump is the main source of drinking water for 65% of the households.
4. There has been some improvement in access to safe drinking water in both rural and urban areas in the basin states. However, increasing access of households to tap/hand pump/tube well water does not mean that the households have clean and safe drinking water. There may be possibility of contamination of drinking water due to pollution of ground or surface water resources. This is the reason that some households spend lots of money to treat at point of use.
5. Percentage of households treating water at point of use was higher in non-basin states (34%) than the basin states (3.5%). Within the Ganga Basin, the highest percentage of such households was found in Uttarakhand and West Bengal (~8%). Rural-urban difference was also observed in this regard. As against 11% of urban households resorting to treatment at point of use in the basin, there were only 1.3% such households in rural areas. The difference was observed highest in Uttarakhand,

followed by West Bengal. As far as purification of water before drinking is concerned, the condition of households was quite dismal in Uttar Pradesh and Bihar.

6. Out of total urban households who reported use of any method of water purification in the Ganga Basin, about 14% used RO, while the corresponding percentage in non-basin states was only 5. In rural areas, proportion of such households was quite less (4.58% in the Ganga Basin and 0.70% in the non-basin states).

7. In Ganga basin, only 3 households per 1000 used water bottles as compared to 52 households per 1000 in non-basin states and 16 households per 1000 in India. In urban areas only 7 households per 1000 consumed bottled water in the Ganga Basin, while the corresponding numbers in non-basin states and India were 129 and 31 respectively. This suggests that proportion of households using bottled water for drinking water was higher in non-basin than the basin states. Within Ganga Basin, Uttarakhand has the highest proportion of households using bottled water in both rural (22 households per 1000) and urban (37 households per 1000) areas.

8. In Uttar Pradesh, bottled water was used only in 7 districts, viz., G B Nagar (35.62% of hhs), Kanpur Nagar (25.44% of hhs), Agra (13.39% of hhs), Bulandshahr (9.99% of hhs), Mau (6.98% of hhs), Varanasi (5.86% of hhs) and Ghaziabad (2.73% of hhs). Poor quality of water supply, high level of hardness in groundwater, rising income of households, increasing concern on health, among others are main reasons for rising reliance on bottled water.

9. About 13 million households in urban areas and 2.12 million households in rural area used RO to purify drinking water in the Ganga basin. The agrigate cost of using ROs by these households works out to be about Rs. 1,52,100 million (37% of total cost of ROs in India).

10. Total expenditure on bottled water used by households in the Ganga Basin is estimated to be Rs.1,423 million which constitues 5.75% of total expenditure on bottled water in India.

11. Notwithstanding increase in access to sanitation duirng 2001-2011, it is shocking to note that more than 60% of the households in the Ganga Basin did not have toilet facility within premises. Bihar, UP and West Bengal have reported widespread open defecation in the range of 41-75%.

12. On an average, proportion of ailing persons (PAP) was higher in urban than rural areas. The urban-rural difference in the PAP was higher in the Ganga Basin (2.6% point), than the national average (1.1% point). Further, PAP in both rural and urban areas was observed higher in the Ganga Basin than the non-basin states. Within the basin states, the intensity of morbidity measured in terms of PAP was highest in West Bengal, followed by Uttar Pradesh in rural and urban areas both. It was least in rural Bihar and Uttarakhand which is attributed to, among others, less stressful lifestyle, fresh air and water, etc.

13. Number of persons hospitalised per 1000 population varies significantly across rural and urban areas and age groups and it is difficult to draw any conclusions. For instance while Uttarakhand reports low PAP, but it also had highest number of persons hospitalised per 1000 in rural areas. On the otherhand while rural areas of Bihar reported lowest PAP, it also has lowest hospitalisation rates.

14. Both rural and urban areas have been significantly affected by diarrhoea/ dysentery and 'fever of unknown origin'. Rural and urban households in Bihar and West Bengal and urban households in Uttar Pradesh were significantly affected by Diarrhoea/ dysentery. The study further finds that water borne diseases have led to higher rates of hospitalisation in the basin states than the non-basin states.

15. The share of Ganga basin in India's total public expenditure on health has increased from 17.71% in 2001-02 to 18.27% in 2004-05, while that of private sector has declined from 34.15% to 27.22% during the same years. However, private sector still accounts for a major share in the overall expenditure on health.

16. The budgetary allocation on health sector in the basin has gone up from Rs.4,908.5 crores during the 10^{th} Plan to Rs.20,098.4 crores during the 11^{th} Plan. While in all other states the allocation during the same time period has increased substantially, surprisingly in the case of Bihar it went down from Rs.1079 crores to Rs.873 crores. This could be attributed to, among others, challenges in governance, political instability and lack of initiatives for implementation.

17. Total expenditure per treated ailment varied widely across the basin states. In rural areas, it varied from Rs.225 in West Bengal to Rs. 551 in Uttarakhand, and in the urban areas, from Rs.266 in Uttarakhand to Rs. 372 in Bihar. Interestingly, contrary to what is observed for most of the states as well as for the country as a whole, Uttar Pradesh and Uttarakhand reported higher expenditure per treated ailment in rural areas than in urban areas.

18. Loss of income due to illness put additional burden on households. The loss of income per ailment was observed highest in Bihar (Rs. 585), followed by Uttar Pradesh (Rs. 152) in rural areas. In urban areas also, the loss was estimated to be highest in Bihar (Rs. 150), followed by Uttar Pradesh (Rs. 117). Prevention of morbidly would not only reduce the burden of medical expenditure but also help to reduce the loss of productivity in the economy. It is also significant to note that loss of household income per ailment in rural areas of Bihar was even higher than the actual expenditure on treatment.

9.2 Recommendations

This study argues that health status of people of the Ganga basin can be improved and burden of diseases be reduced if access to safe drinking water and proper sanitary & drainage facilities are provided. Providing tap/hand pump water to the households may not

always be considered as safe water if the very source of the water is polluted and contaminated due to point and non-point of sources of pollution. It is, therefore, necessary that no industrial effluents, domestic sewage, and pesticides & chemical fertilizers should go into the ground and surface water sources. For that, water, sanitation, health and environment related issues are required to be addressed in an integrated manner. This study suggests the following actionable points for the GRBMP:

1. For properly functioning water supply and sanitation services, capacity of local self-government institutions be improved. Under 73rd and 74th constitutional amendments, water, sewage and sanitation are the subjects of these institutions. Apart from equipping them with trained staff and sufficient funds, elected members of these institutions be sensitized and made aware of the tangible and intangible benefits of proper operation construction, management and maintenance of safe drinking water and sanitation services. A clean hygienic environment can be ensured only when people make demand for clean water and integrated sanitation & sewage system. Therefore, with the involvement of civil society organizations, local demand for improved water and sanitation services should be created so that delivering institutions be pressurized to improve quality of services.
2. In rural areas, Gram Panchayats should be entrusted the task of formulation and implementation of village master plan for water supply, sewage and drainage with the technical assistance from line departments. Open air defecation should be discouraged to prevent water-borne diseases.
3. Public toilets may not be effective in providing sanitation services due to maintenance problems. Likewise indiscriminate construction of individual household latrines is not leading to desired outscome because quality of construction is very poor.There is a strong need to create capacity at the lowest level for proper implementation, supervision and monitoirng.
4. There is also an overarching need to promote sustainable on-site sanitation, especially in rural and semi-urban areas across the entire Ganga basin, whereby potential pollution arising from excreta/ sewage discharges can be minimised and a reasonable level of 'resource' recovery could be achieved. There is an urgent need to explore 'out of the box' solutions.
5. Monitoring quality of drinking water by the government machinery would not be feasible and economically viable in rural areas. There is need to train at least five young persons in each village in the areas of water, sanitation and health so that they may periodically monitor quality of drinking water, educate households about the benefits of safe drinking water and improved sanitation, and establish the link with the healthcare service providers. These trained youths should also be involved in maintaining the socio-economic, demographic and health related database at

village level. Maintenance of such database is necessary to design, formulate and implement effective grassroots level sustainable community development works. These trained youths may be paid appropriate stipend/ remuneration by the respective Gram Panchayats.

6. As discussed in our report on "urbanization and industrialization", most of the cities/ towns in the basin do not have proper effluent and sewage treatment and disposal system. It is not only essential to build sewerage network, but also a cost-effective wastewater treatment and recycling system to prevent negative health consequences of urbanization and industrialization. It is envisioned that all cities of the basin would have sewage system properly integrated with toilets and sewage treatment plants.
7. There is a need to change households' behavioural and cultural practices related to water and sanitation. Disposal of solid and liquid wastes and open defecation should be restricted through effective regulation.

Notes

1. http://www.frost.com/prod/servlet/press-release.pag?docid=248728723
2. http://www.wssinfo.org/definitions-methods/watsan-categories/

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Appendix Tables

Table A1: Detailed description of water related diseases and its associated terms

Category	Description of category	Type of water	Subcategories	Example(s)
Water-borne micro-biological	Diseases related to consumption of pathogens consumed in water; most due to human	Drinking water	**(i)** Treated or untreated (raw) water **(ii)** Public (municipal) supplies or private supplies	Cholera, Typhoid fever, viral gastroenteriti
Waterborne chemical disease	Disease related to ingestion of toxic substances in water	Drinking water	**(i)** Treated or untreated (raw) water **(ii)** Public (municipal)	Arsenicosis
Water hygiene diseases	Diseases whose incidence, prevalence or severity can be reduced by using safe (clean) water to improve	Any water used for washing /	**(i)** Disease related to variations in water quality **(ii)** Disease related to water Shortage	Scabies, shigellosis; trachoma
Water contact diseases	Caused by skin contact with pathogen- infested water or with chemical-	Recreational water	**(i)** fresh water sources **(ii)** marine waters	Schistosomiasis (bilharzia); cyanobacteria
Water vector habitat diseases	Diseases where vector lives all or part of its life in or adjacent to a water habitat	Untreated freshwater sources	**(i)** rivers, streams **(ii)** small collections of stagnant water e.g. water butts	Malaria (mosquitoes); filiariasis (mosquitoes); onchocerciasis
Excreta disposal diseases	Diseases related to unsanitary disposal of human waste (faeces and urine)	Drinking water and untreated water sources	(i) diseases related to human/animal waste in drinking water (ii) diseases related to	Ascariasis; faecal-oral infections e.g. shigellosis; schistosomiais ; trachoma
Water aerosol diseases	Diseases related to respiratory transmission, where a water aerosol	Drinking or raw water sources	(i) water used in industrial/ residential buildings (ii) raw water sources	Legionellosis (legionnaires' disease; humidifier

Source: WATER AND HEALTH – Vol. I - Classification of Water-Related Disease - R Stanwell-Smith

TABLE A2: Per 1000 distribution of persons hospitalised by type of ailment

AILMENTS	U.P		U.K.		BIHAR		W.B.		GANGA		OTHERS		INDIA	
	R	U	R	U	R	U	R	U	R	U	R	U	R	U
Gastro-intestinal														
Diarrhoea/ dysentery	70	94	53	31	147	112	163	90	116	92	65	56	76	62
Gastritis/gastric or peptic ulcer	62	48	180	93	63	32	54	46	62	48	45	38	48	39
Worm infestation	9	7	0	13	3	2	3	3	6	5	3	4	4	4
Amoebiosis	5	8	8	0	3	5	1	3	3	5	3	3	3	4
Hepatitis/Jaundice	17	20	0	58	14	19	11	24	14	23	15	21	15	22
Cardiovascular Diseases														
Heart disease	33	52	37	136	33	59	56	82	42	68	43	83	43	80
Hypertension	12	20	10	0	6	34	6	18	9	19	21	35	18	32
Respiratory including ear/nose/throat ailments	27	25	45	14	11	15	37	30	28	27	37	30	35	30
Tuberculosis	35	25	27	0	50	25	24	19	33	22	30	17	30	17
Bronchial asthma	27	24	7	0	20	4	15	37	21	28	38	31	34	30
Disorders of joints and bones	14	37	106	34	29	39	5	13	16	26	27	26	25	26
Diseases of kidney/urinary system	37	38	59	84	36	31	39	53	38	46	37	50	37	49
Prostatic disorders	5	4	0	0	12	28	14	12	10	9	2	3	4	4
Gynecological disorders	66	45	30	17	72	87	38	43	56	46	51	52	52	50
Neurological disorders	23	23	4	0	50	35	22	17	27	20	33	35	32	32
Psychiatric disorders	15	11	2	0	10	2	5	10	10	10	10	5	10	6
Eye ailments														
Conjunctivitis	3	3	0	0	5	7	0	0	2	2	2	2	2	2
Glaucoma	19	46	0	0	6	4	3	10	10	27	3	3	5	7
Cataract	34	34	29	6	37	38	19	40	29	36	29	21	29	24
Diseases of skin	5	2	3	0	5	2	5	1	5	1	6	7	6	6
Goitre	0	0	0	0	0	0	0	0	0	0	1	2	1	1
Diabetes mellitus	14	12	0	59	6	17	2	13	8	14	20	26	18	24
Under-nutrition	1	1	0	0	2	5	2	0	1	1	1	2	1	2
Anaemia	7	2	0	0	4	15	12	6	8	4	9	12	9	11

AILMENTS	U.P		U.K.		BIHAR		W.B.		GANGA		OTHERS		INDIA	
	R	U	R	U	R	U	R	U	R	U	R	U	R	U
Febrile illnesses														
Malaria	6	11	0	0	12	2	23	10	13	10	37	42	32	36
Eruptive	0	2	0	0	1	0	0	0	0	1	4	1	3	1
Mumps	1	0	0	0	0	0	0	0	1	0	1	0	1	0
Diphtheria	1	2	0	0	1	0	0	0	0	1	2	5	1	4
Whooping cough	2	1	0	0	1	0	1	2	1	1	8	7	7	6
Fever of unknown origin	54	67	45	7	37	18	24	26	40	45	90	73	79	68
Tetanus	13	3	0	0	8	0	6	1	9	2	1	2	3	2
Filariasis/Elephantiasis	3	3	0	0	2	4	1	0	2	2	1	1	1	1
Disabilities														
Locomotor	19	6	19	0	20	6	6	11	14	8	13	9	13	9
Visual including blindness (excluding cataract)	5	1	0	0	4	0	1	0	3	0	4	4	4	3
Speech	0	0	0	0	0	0	6	0	2	0	0	0	1	0
Hearing	1	1	13	0	1	0	0	2	1	1	2	1	2	1
Diseases of Mouth/Teeth/Gum	2	1	0	0	3	3	3	0	3	0	2	2	2	2
Accidents/Injuries/Burns/Fractures/Poisoning	118	103	172	136	76	135	137	78	119	94	96	87	101	88
Cancer and other tumours	33	28	7	19	15	25	26	37	27	32	29	32	28	32
Others														
Other diagnosed ailments	174	176	132	263	166	158	185	253	176	212	161	155	164	166
Other undiagnosed ailments	25	14	12	29	28	29	44	10	32	13	16	15	19	15
TOTAL	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

Source: Unit level records of NSS 60th round Unit level data, 'Morbidity, Health Care and the Condition of the Aged, Jan.-June, 2004'

Table A3: Number of Cases and Deaths due to water borne and vector -borne diseases

Diseases	Year	Uttarakhand		Uttar Pradesh		Bihar		West Bengal		Ganga Basin India			
		Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
Cholera	2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	2005	0	0	2	0	0	0	236	0	238	0	3155	6
	2011	0	0	9	0	0	0	652	0	661	0	2341	10
Acute Diarrhoeal Disease	2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	2005	48480	4	108147	73	NR	NR	1347500	545	1504127	622	9046892	1647
	2011	79643	26	554770	185	130276	0	1854651	288	2619340	499	10231049	1269
Enteric Fever (Typhoid)	2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	2005	4515	0	9691	22	NR	NR	54680	55	68886	77	567638	389
	2011	13760	1	117537	80	NR	NR	127180	34	273264	115	1062446	346
Viral Hepatitis (All Causes)	2001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	2005	884	1	307	5	NR	NR	4837	114	6028	120	152087	651
	2011	3143	19	7749	28	202	0	5480	105	16574	152	94402	520
Japanese Encephalitis	2001	0	0	1005	199	48	11	119	21	1172	231	2061	479
	2005	0	0	6061	1500	192	64	12	6	6265	1570	6727	1682
	2011	0	0	3492	579	821	197	714	58	5027	834	8249	1169
Malaria	2001	1196	0	94524	15	4108	0	145053	191	244881	206	2085484	1005
	2005	1242	0	105303	0	2733	1	185964	175	295242	176	1816342	963
	2011	1162	2	56438	0	2390	0	66465	14	126455	16	1278760	463
Dengue	2001	0	0	21	0	0	0	0	0	21	0	3306	53
	2005	0	0	121	4	0	0	6375	34	6496	38	938	8
	2011	100	0	147	5	21	0	510	0	778	5	18059	119

Source: National Health Profile of India Reports (2005-2011)

Note: NR- Not Reported, NA- Not Available

Table A4: District-wise No. of Sub Centres, PHCs, CHS per 1000 Population in Bihar, 2011

Districts	Sub Centres	PHCs	CHCs	Districts	Sub Centres	PHCs	CHCs
Begusarai	10.29	72.06	1477.18	**Gopalganj**	13.12	73.09	852.68
Bhojpur	10.04	72.20	1010.74	**Jamui**	6.29	30.81	585.36
Bhagalpur	10.54	38.31	906.72	**Jehanabad**	12.22	27.42	562.09
Buxar	11.62	48.79	(-)	**Kaimur (Bhabua)**	8.89	54.23	813.45
Katihar	9.30	49.49	3068.15	**Kishanganj**	12.43	105.68	845.47
Khagaria	9.69	63.75	1657.60	**Madhepura**	7.33	55.41	(-)
Lakhisarai	9.81	45.49	1000.72	**Madhubani**	10.31	50.86	1492.01
Munger	9.00	45.30	(-)	**Muzaffarpur**	9.96	50.84	4778.61
Patna	14.92	67.92	1924.27	**Nalanda**	7.68	43.52	957.51
Samastipur	11.75	65.46	4254.78	**Nawada**	6.82	33.08	1108.33
Saran	9.55	62.59	1314.37	**Purnia**	9.80	74.39	1636.56
Vaishali	10.43	74.37	1165.08	**Rohtas**	15.93	58.09	1481.30
Araria	14.10	85.04	1403.10	**Saharsa**	12.48	45.17	(-)
Arwal	10.93	24.98	(-)	**Sheikhpura**	7.47	27.61	634.93
Aurangabad	11.63	35.87	837.08	**Sheohar**	22.65	54.74	656.92
Banka	7.66	47.19	676.45	**Sitamarhi**	16.13	63.33	1709.81
Darbhanga	15.14	71.31	1960.99	**Siwan**	9.04	54.40	1106.06
Champaran(E)	15.54	69.63	5082.87	**Supaul**	12.52	71.88	1114.20
Gaya	9.95	61.68	2189.69	**Champaran (W)**	10.66	74.01	1961.39

Source: RHS Bulletin, Ministry of Health & Family Welfare

Table A5: Medical Colleges in Uttar Pradesh with No. of Beds Attached (2011)

District/city/town	Government	Private	No. of Beds in Attached Hospital
Agra	1	0	1047
Aligarh	1	0	NA
Allahabad	1	0	850
Ambedkarnagar	1	0	NA
Barabanki	0	1	350
Bareilly	0	2	1250
Etawah	1	0	750
Farrukhabad	0	1	350
Ghaziabad	0	2	700
Gorakhpur	1	0	NA
Hapur	0	1	500
Jhansi	1	0	700
Kanpur	1	0	1825
Kanpur	0	1	1000
Lucknow	1	2	3900
Meerut	1	1	1840
Moradabad	0	1	550
Muzaffarnagar	0	1	500
Noida	0	1	500
Varanasi	1	0	1200
Uttar Pradesh	**11**	**14**	**17812**

Source: National Health Profile, 2011

Table A6: Proportion of households treating water before drinking and per 1000 distribution of such households by type of water treatment, Uttarakhand (2004)

Districts	Sectors	Ultra-violet/ resin/reverse osmosis	Filter	Boiling	Others	No. per 1000 Treating water Before drinking
Dehradun	**Rural**	(---)	(---)	(---)	(---)	(---)
	Urban	33.61%	25.05%	23.38%	17.97%	199
Pithoragarh	**Rural**	(---)	(---)	(---)	(---)	(---)
	Urban	0.00%	98.92%	1.08%	0.00%	900
Champavat	**Rural**	(---)	(---)	(---)	(---)	(---)
	Urban	0.00%	0.00%	100.00%	0.00%	19
Almora	**Rural**	(---)	(---)	(---)	(---)	(---)
	Urban	0.00%	7.81%	92.19%	0.00%	777
U S Nagar	**Rural**	(---)	(---)	(---)	(---)	(---)
	Urban	0.00%	100.00%	0.00%	0.00%	5
Hardwar	**Rural**	100.00%	0.00%	0.00%	0.00%	1
	Urban	12.10%	5.83%	82.07%	0.00%	90
UK	**Rural**	100.00%	0.00%	0.00%	0.00%	1
	Urban	6.03%	40.83%	50.47%	2.67%	305

Source: NSS 60th round Unit level data, 'Morbidity, Health Care and the Condition of the Aged, Jan.-June, 2004

Table A7: Proportion of households treating water before drinking and per 1000 distribution of such households by type of water treatment, Bihar (2004)

Districts	Sectors	Ultra-violet/ resin/reverse osmosis	Boiling	Filter	Cloth screen	Others	No. per 1000 Treating water Before drinking
Champaran(W)	Rural	(--)	(--)	(--)	(--)	(--)	(--)
	Urban	0%	0%	100%	0%	0%	22
Champaran(E)	Rural	(--)	(--)	(--)	(--)	(--)	(--)
	Urban	0%	0%	100%	0%	0%	54
Purnia	Rural	(--)	(--)	(--)	(--)	(--)	(--)
	Urban	0%	0%	100%	0%	0%	69
Katihar	Rural	0%	100%	0%	0%	0%	1
	Urban	(--)	(--)	(--)	(--)	(--)	(--)
Muzaffarpur	Rural	0%	100%	0%	0%	0%	7
	Urban	0%	0%	100%	0%	0%	180
Siwan	Rural	0%	0%	11%	0%	89%	12
	Urban	(--)	(--)	(--)	(--)	(--)	(--)
Saran	Rural	(--)	(--)	(--)	(--)	(--)	(--)
	Urban	0%	0%	100%	0%	0%	161
Vaishali	Rural	50%	50%	0%	0%	0%	2
	Urban	(--)	(--)	(--)	(--)	(--)	(--)
Samastipur	Rural	0%	77%	23%	0%	0%	12
	Urban	(--)	(--)	(--)	(--)	(--)	(--)
Bhagalpur	Rural	0%	100%	0%	0%	0%	8
	Urban	0%	0%	100%	0%	0%	8
Munger	Rural	(--)	(--)	(--)	(--)	(--)	(--)
	Urban	0%	1%	99%	0%	0%	182
Patna	Rural	0%	0%	0%	100%	0%	28
	Urban	0%	1%	97%	0%	2%	67
Kaimur (Bhabua)	Rural	0%	0%	0%	100%	0%	4
	Urban	(--)	(--)	(--)	(--)	(--)	(--)
Gaya	Rural	(--)	(--)	(--)	(--)	(--)	(--)
	Urban	0%	100%	0%	0%	0%	37
Bihar	Rural	2%	41%	6%	38%	13%	3
	Urban	0%	4%	95%	0%	1%	63

Source: NSS 60th round Unit level data, 'Morbidity, Health Care and the Condition of the Aged, Jan.-June, 2004

Table A8: Proportion of households treating water before drinking and per 1000 distribution of such households by type of water treatment, West Bengal (2004)

Districts	Sectors	RO	Boiling	Filter	Cloth Screen	Any disinfectant	Others	No. per 1000 Treating water Before drinking
Darjiling	Rural	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	52
	Urban	0.00%	28.40%	67.30%	0.00%	0.00%	4.31%	249
Jalpaiguri	Rural	0.00%	76.97%	23.03%	0.00%	0.00%	0.00%	61
	Urban	0.00%	0.00%	33.29%	0.00%	3.14%	63.57%	271
Koch Bihar	Rural	0.00%	89.81%	10.19%	0.00%	0.00%	0.00%	21
	Urban	(--)	(--)	(--)	(--)	(--)	(--)	(--)
Uttar Dinajpur	Rural	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	6
	Urban	0.00%	5.49%	94.51%	0.00%	0.00%	0.00%	126
Dakshin Dinajpur	Rural	(--)	(--)	(--)	(--)	(--)	(--)	0
	Urban	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	59
Maldah	Rural	0.00%	2.73%	0.00%	0.00%	19.27%	78.00%	17
	Urban	(--)	(--)	(--)	(--)	(--)	(--)	0
Murshidabad	Rural	0.00%	27.15%	2.10%	27.04%	4.51%	39.20%	35
	Urban	9.67%	0.00%	84.72%	5.62%	0.00%	0.00%	304
Birbhum	Rural	0.00%	0.00%	8.91%	87.05%	0.00%	4.04%	43
	Urban	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	39
Barddhaman	Rural	0.00%	0.00%	9.32%	0.00%	90.68%	0.00%	14
	Urban	0.00%	2.23%	95.53%	2.24%	0.00%	0.00%	166
Nadia	Rural	0.00%	0.00%	2.51%	15.52%	36.53%	45.44%	28
	Urban	0.00%	5.10%	86.47%	8.43%	0.00%	0.00%	74
North 24-Parganas	Rural	0.00%	12.61%	87.39%	0.00%	0.00%	0.00%	9
	Urban	14.53%	10.13%	71.86%	0.22%	3.25%	0.00%	241
Hugli	Rural	0.00%	0.00%	12.27%	6.98%	0.00%	80.75%	11
	Urban	17.06%	23.13%	59.81%	0.00%	0.00%	0.00%	129
Bankura	Rural	0.00%	12.12%	6.94%	44.38%	36.56%	0.00%	125
	Urban	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	324
Puruliya	Rural	0.00%	32.00%	1.03%	60.65%	6.32%	0.00%	47
	Urban	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	77
Medinipur	Rural	8.24%	55.23%	36.08%	0.00%	0.45%	0.00%	40
	Urban	8.02%	8.80%	75.02%	0.00%	0.00%	8.16%	366
Howrah	Rural	0.00%	31.95%	68.05%	0.00%	0.00%	0.00%	94
	Urban	17.36%	10.57%	72.07%	0.00%	0.00%	0.00%	123
Kolkata	Rural	(--)	(--)	(--)	(--)	(--)	(--)	(--)
	Urban	31.29%	1.20%	64.42%	2.85%	0.25%	0.00%	227
South 24-Parganas	Rural	0.00%	0.00%	65.36%	34.64%	0.00%	0.00%	34
	Urban	3.59%	9.86%	74.36%	12.19%	0.00%	0.00%	70
West Bengal	Rural	1.36%	29.75%	25.33%	21.46%	11.51%	10.59%	35
	Urban	16.20%	6.92%	72.22%	1.88%	1.10%	1.68%	188

Source: NSS 60th round Unit level data, 'Morbidity, Health Care and the Condition of the Aged, Jan.-June, 2004

Table A9 : Distribution of Households by Main sources of Latrine (2011) , Bihar

	Districts	Water Closet	Pit Latrine	others	No latrine
Bank Districts	**1. Begusarai**	25.58%	5.24%	0.50%	68.69%
	2. Bhagalpur	27.02%	5.96%	0.74%	66.28%
	3. Bhojpur	24.71%	1.87%	0.61%	72.81%
	4. Buxar	22.86%	1.39%	0.46%	75.29%
	5. Katihar	13.23%	3.86%	0.42%	82.49%
	6. Khagaria	18.78%	4.39%	0.65%	76.18%
	7. Lakhisarai	26.61%	4.62%	0.59%	68.18%
	8. Munger	33.05%	4.77%	1.00%	61.18%
	9. Patna	48.66%	3.52%	0.83%	46.99%
	10. Samastipur	16.31%	2.18%	0.26%	81.25%
	11. Saran	19.82%	1.16%	0.45%	78.57%
	12. Vaishali	23.52%	3.28%	0.38%	72.83%
	Districts	Water Closet	Pit Latrine	others	No latrine
Non-Bank districts	**1. Araria**	7.62%	1.48%	0.26%	90.64%
	2. Aurangabad	19.98%	1.32%	0.48%	78.22%
	3. Banka	10.97%	1.04%	0.24%	87.75%
	4. Darbhanga	21.72%	2.95%	0.46%	74.87%
	5.Champaran (E)	16.50%	1.43%	0.31%	81.76%
	6. Gaya	20.77%	2.74%	0.72%	75.78%
	7. Gopalganj	18.14%	1.38%	0.50%	79.98%
	8. Jahandab	23.56%	2.04%	0.55%	73.85%
	9. Jamui	11.96%	2.43%	0.44%	85.17%
	10. Kaimur	15.31%	0.99%	0.42%	83.27%
	11. Kisangan	8.10%	1.98%	0.30%	89.62%
	12.Madhepura	10.56%	2.23%	0.28%	86.94%
	13. Madhubani	16.27%	1.88%	0.38%	81.48%
	14.Muzzarfarpur	24.42%	2.26%	0.38%	72.94%
	15. Nalanda	26.31%	3.71%	0.70%	69.29%
	16. Nawada	18.69%	3.13%	0.47%	77.71%
	17. Purnia	10.81%	2.57%	0.32%	86.30%
	18. Rohtas	26.38%	1.19%	0.65%	71.78%
	19. Saharsa	13.89%	2.47%	0.37%	83.27%
	20. Seikhpura	22.78%	5.57%	0.58%	71.07%
	21. Sheohar	16.94%	3.08%	0.40%	79.58%
	22. Sitamarhi	18.61%	1.77%	0.40%	79.21%
	23. Siwan	20.74%	1.66%	0.48%	77.12%
	24. Supaul	9.31%	1.32%	0.20%	89.17%
	25. Champaran (W)	13.95%	1.51%	0.41%	84.13%