

# State of Health in the Ganga River Basin

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## 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 GRBMP 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. A list of persons who have contributed directly and names of those who have taken lead in preparing this report is given on the reverse side.

Dr Vinod Tare  
Professor and Coordinator  
Development of GRBMP  
IIT Kanpur

## The Team

BhagirathBehera, IIT Kharagpur  
C Kumar, IIT Roorkee  
D K Nauriyal, IIT Roorkee  
N C Nayak, IIT Kharagpur  
P M Prasad, IIT Kanpur  
Prema Rajgopalan, IIT Madras  
Pulak Mishra, IIT Kharagpur  
Pushpa L Trivedi, IIT Bombay  
Rajat Agrawal, IIT Roorkee  
S P Singh, IIT Roorkee  
Seema Sharma, IIT Delhi  
T N Mazumder, IIT Kharagpur  
V B Upadhyay, IIT Delhi  
Vinay Sharma, IIT Roorkee  
Vinod Tare, IIT Kanpur

*bhagirath@hss.iitkgp.ernet.in*  
*c.kumar803@gmail.com*  
*dknarfhs@iitr.ernet.in*  
*ncnayak@hss.iitkgp.ernet.in*  
*pmprasad@iitk.ac.in*  
*prema@iitm.ac.in*  
*pmishra@hss.iitkgp.ernet.in*  
*trivedi@hss.iitb.ac.in*  
*rajatfdm@iitr.ernet.in*  
*singhfhs@iitr.ernet.in*  
*seemash@dms.iitd.ac.in*  
*taraknm@arp.iitkgp.ernet.in*  
*upadhyay@hss.iitd.ac.in*  
*vinayfdm@iitr.ernet.in*  
*vinod@iitk.ac.in*

## Lead Authors

D K Nauriyal, IIT Roorkee  
N C Nayak, IIT Kharagpur  
Pulak Mishra, IIT Kharagpur  
PushpaTrivedi, IIT Bombay  
Rajat Agrawal, IIT Roorkee  
S P Singh, IIT Roorkee  
Seema Sharma, IIT Delhi  
V B Upadhyay, IIT Delhi  
Vinay Sharma, IIT Roorkee

*dknarfhs@iitr.ernet.in*  
*ncnayak@hss.iitkgp.ernet.in*  
*pmishra@hss.iitkgp.ernet.in*  
*trivedi@hss.iitb.ac.in*  
*rajatfdm@iitr.ernet.in*  
*singhfhs@iitr.ernet.in*  
*seemash@dms.iitd.ac.in*  
*upadhyay@hss.iitd.ac.in*  
*vinayfdm@iitr.ernet.in*

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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 (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 effluent are major causes of degradation of river water quality. The total wastewater generation from 222 towns in Ganga basin is estimated to be 8250 million litres per day (MLD), out of which 2538 MLD is directly discharged into the Ganga River, 4491 MLD is disposed into its tributaries and 1220 MLD is disposed of on land or low lying areas. Furthermore, Uttar Pradesh contributed more than 55% of the total urban and industrial pollution load to the basin. (CPCB, "Status of Sewage Treatment Plants in Ganga Basin")

The untreated or improperly treated wastewaters discharged into water bodies, 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 payments on health (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 by controlling pollution and reducing degradation of river and ground water and. 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 very closely related. 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 use, 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 increasing use of chemicals for agriculture pollute 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 an overview of existing public healthcare infrastructure and makes detailed discussion on healthcare expenditure, however, the focus is 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.

## 1.2 Scope of the Study

The foremost objective of the study is to analyse health status along with medical & health expenditure incurred by the households across the basin. With the premise of significantly enhanced water pollution in the basin, it has been inferred that medical and health expenditure of the residents has increased, especially in relation to water related diseases. This report has been divided into two major sections, one for aggregate analyses (section 4 to 6) and another for district-wise analyses (Section 7 and 8). Both the sections 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 presents health expenditure - mainly public and private expenditure at aggregate level. This section also analyses medical treatment expenditure and loss of household income for non-hospitalised and hospitalised treatment in the Ganga basin states. The report ends with Sections 9 which presents conclusions, policy implication and recommendations.

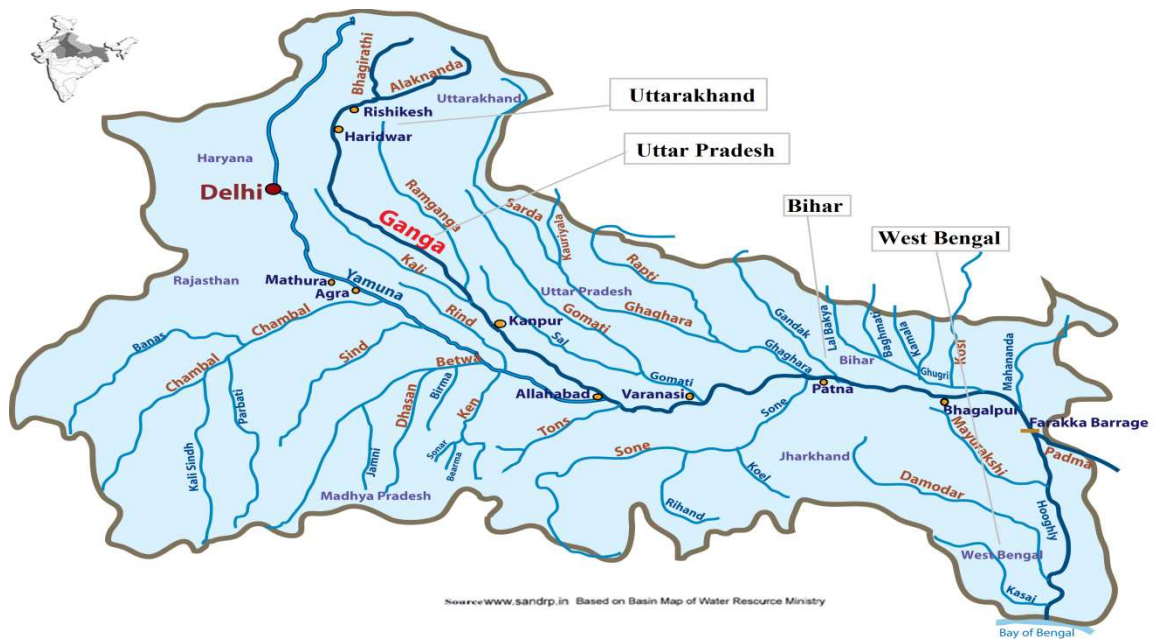
## 2. Data Sources and Methodology

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

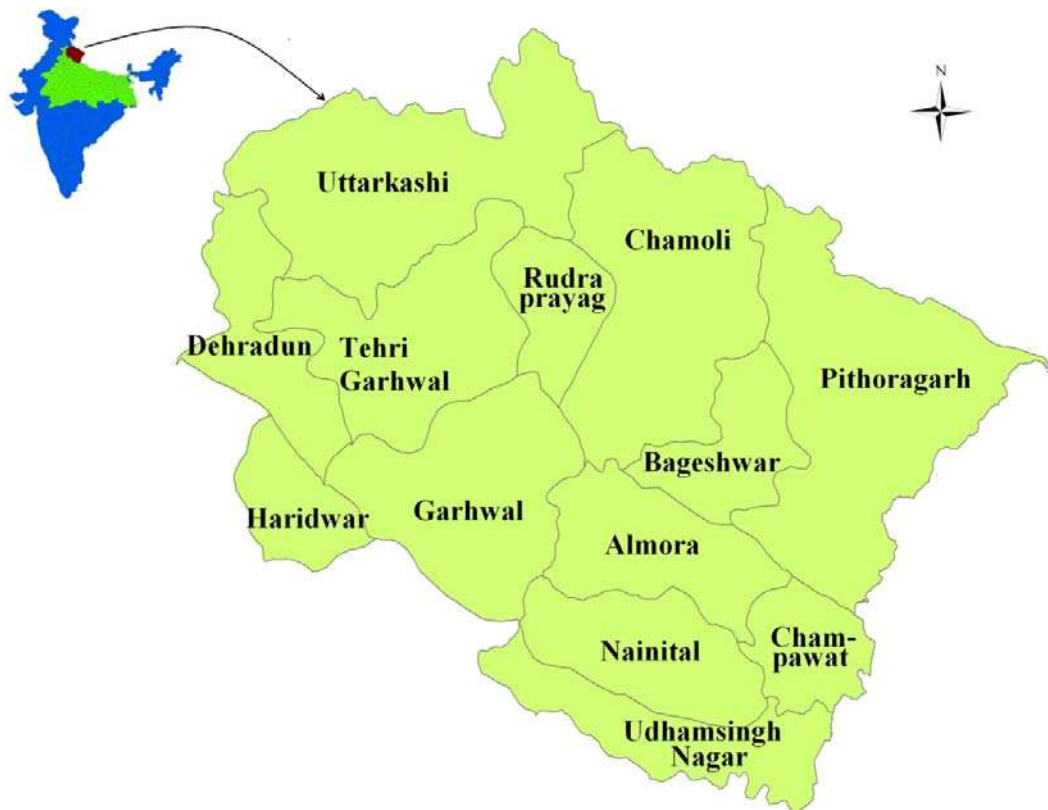
through the unit level records of the 60<sup>th</sup> Round of the NSSO (Report of the 60<sup>th</sup> Round on Morbidity, Healthcare and Condition of the Aged, 2004) has been used to estimate household expenditures on health. This survey covered 73,868 households and 3,83,338 persons spread across all 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 at point of use has also been collected to find out expenditure incurred by households on such practices. Data on medical expenditure and loss of household income due to hospitalisation have also been collected from this particular round of NSS. Census of India has also been an important source of data for 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 60<sup>th</sup> 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 scenario has been made on various important aspects. As discuss earlier, the report is divided into two parts. First part discusses 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) i.e., Uttar Pradesh, Bihar and West Bengal, the disaggregated discussion is carried out in terms of groups or regions. On the basis of proximity to River Gang in the case of Bihar and West Bengal the districts are classified into two categories, i.e., viz., bank districts and non-bank districts; and in the case of Uttar Pradesh the classification is into five regions viz., 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).

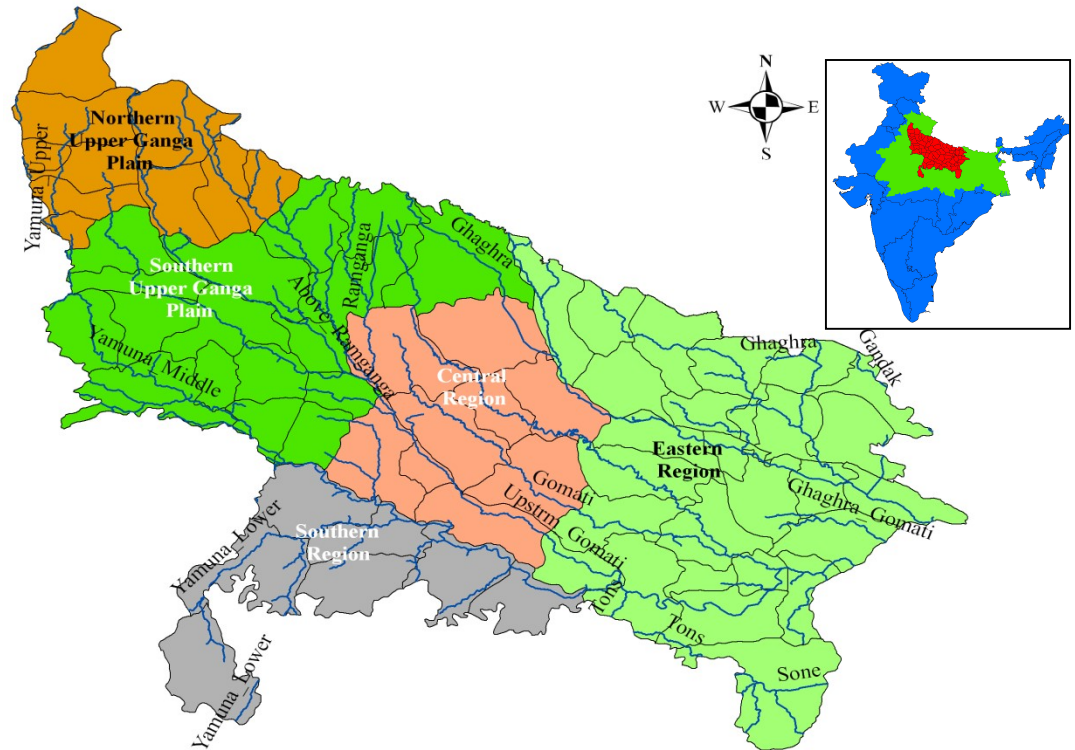
Map-1 depicts the location of the Ganga Basin, along with its adjoining states. Map-2 illustrates the location of districts in Uttarakhand. Map-3 shows map of Uttar Pradesh along with all five regions. Map 4 and 5 depict position of bank and non- bank districts in Bihar and West Bengal, respectively.



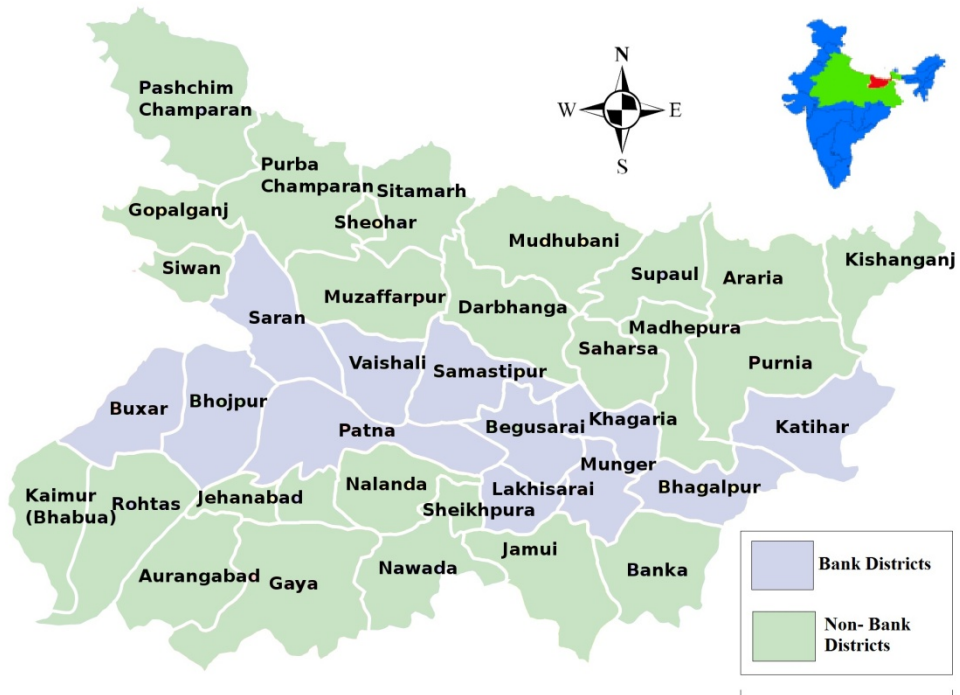
**Map 1: Location of the Ganga Basin**



**Map 2: District map of Uttarakhand**



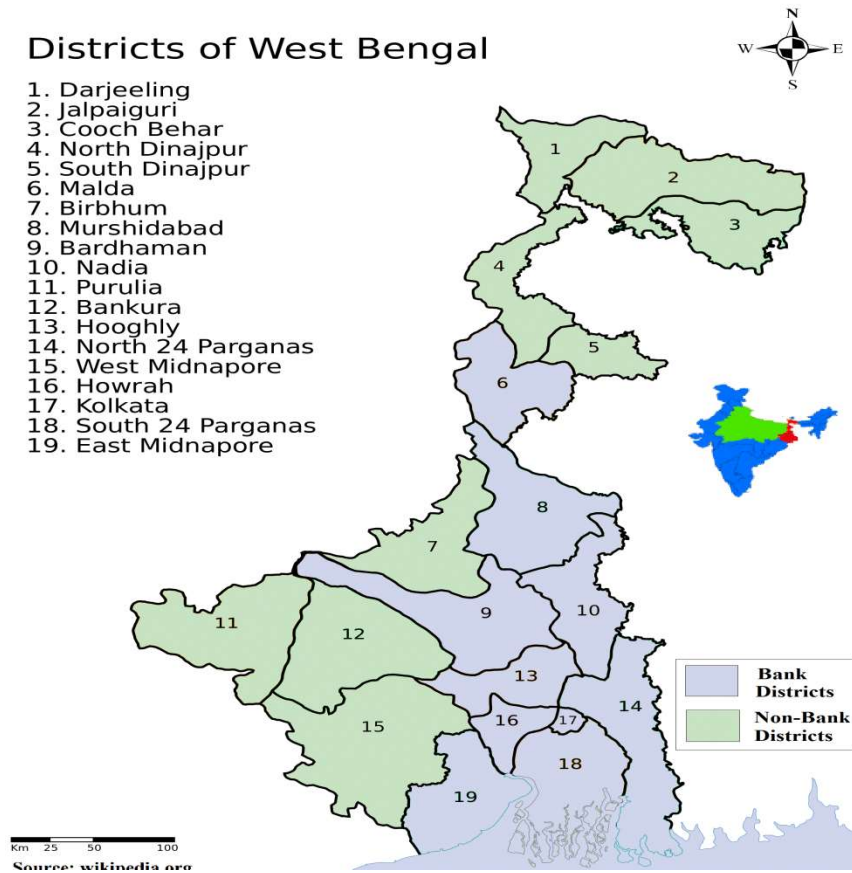
**Map 3: Region-wise Ganga basin map of Uttar Pradesh**



**Map 4: Bank and non-bank districts in the Bihar part of the Ganga Basin**

## Districts of West Bengal

1. Darjeeling
2. Jalpaiguri
3. Cooch Behar
4. North Dinajpur
5. South Dinajpur
6. Malda
7. Birbhum
8. Murshidabad
9. Bardhaman
10. Nadia
11. Purulia
12. Bankura
13. Hooghly
14. North 24 Parganas
15. West Midnapore
16. Howrah
17. Kolkata
18. South 24 Parganas
19. East Midnapore



**Map 5: Bank and non-bank districts in the West Bengal part of the Ganga Basin**

### 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 sewage, indiscriminate open disposal of municipal solid waste from urban areas along the river banks (on account of, among others, lack of sanitary landfill sites), disposal of animal carcasses, open defecation and finally non-point discharges of pesticides and chemical fertilizers represent main causes of degradation of surface and ground water resources. Ganga River has slowly become a safe haven for viruses and bacteria causing host of 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 infant 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 rate, death rate, IMR, CMR and 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    |
| <b>Bihar</b> | 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 |
| <b>UK</b>    | 19.3         | 20.2 | 16.2 | 6.3         | 6.7 | 5.1 | 38                     | 41 | 25 | (-)                          | (-)  | (-)  | (-)                             | (-)  | (-)  |
| <b>U P</b>   | 28.3         | 29.2 | 24.2 | 8.1         | 8.5 | 6.3 | 61                     | 64 | 44 | 20.1                         | 21   | 15.4 | 60                              | 59.2 | 64   |
| <b>WB</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 |
| <b>India</b> | 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)

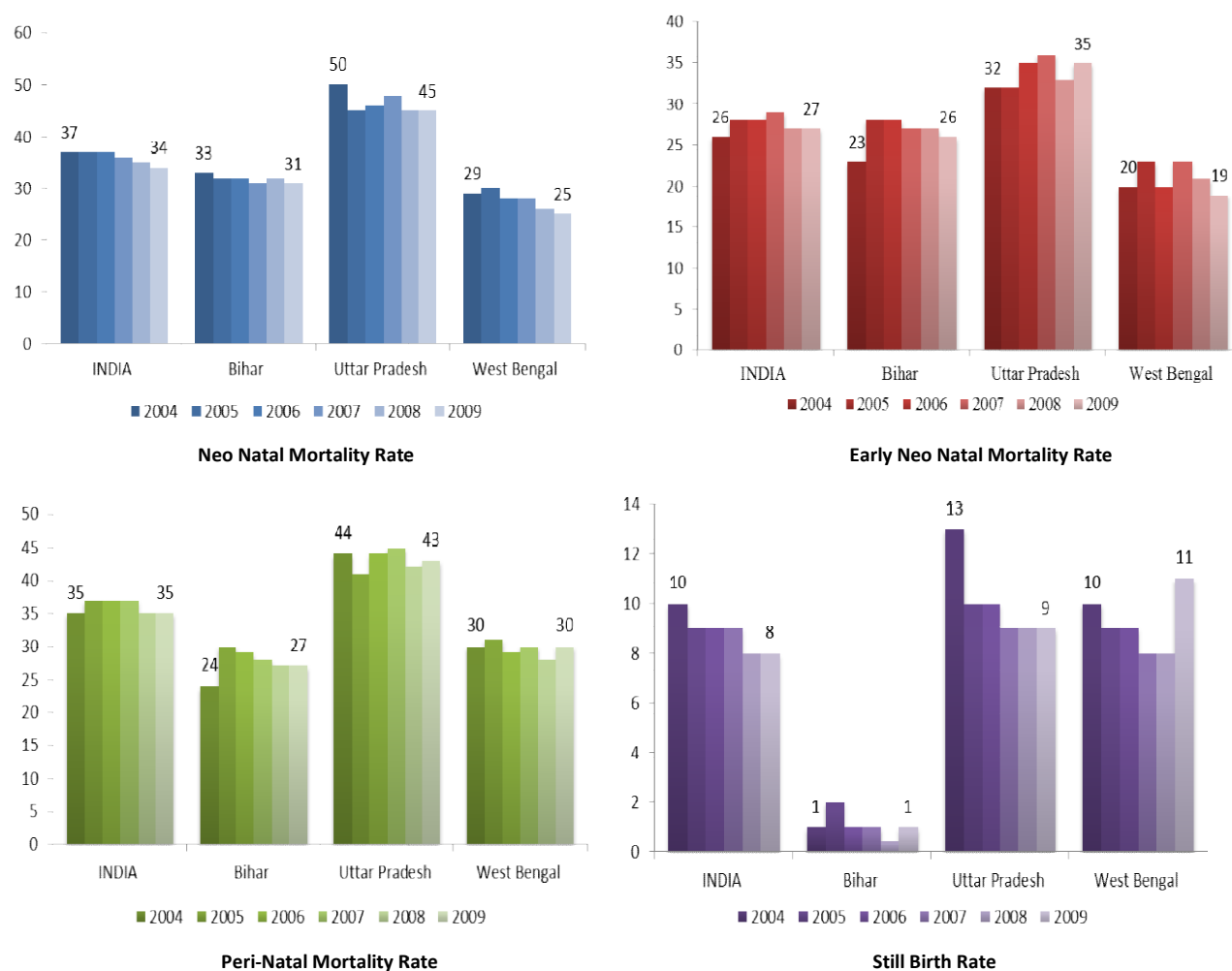
The data shown in Table 1 clearly reveals that overall the birth rate (BR) was observed highest in Uttar Pradesh (28.3), closely followed by Bihar (28.1) and lowest in West Bengal (16.8). BRs in Uttarakhand and West Bengal were lower than the national average, while in the most populated stretch of Uttar 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 almost double of West Bengal. Rural-urban difference in the IMR is substantial in all the states and this is attributed to poor access to healthcare infrastructure in rural areas in the entire basin.

The child mortality rate (CMR), which is taken as a good proxy for incidence of water borne diseases, shows poor performance of health care services in Bihar and Uttar Pradesh; On the other hand West Bengal appears to have performed better than the national average. Overall status of 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.

Based on the above it can be concluded that overall health profile is better in West Bengal and Uttarakhand and poor in Uttar Pradesh and Bihar. As shown in the next section, better

performance in Uttarakhand and West Bengal can be attributed to, among others, better public healthcare infrastructure.

Figure 1 shows neo-natal mortality rate, early neo-natal mortality rate, peri-natal mortality rate and still birth rate in UP, Bihar and West Bengal (data for Uttarakhand is not available). These indicators reflect on several aspects related to health infrastructure and environmental condition and pollution. It is evident that all the indicators are highest in Uttar Pradesh and lowest in West Bengal (except still birth rate which was lowest in Bihar). This shows that that general health status in West Bengal is better than Uttar Pradesh and Bihar, which could be attributed to, among others, improved access, nutrition, etc. but not necessarily to water and sanitation as the latter faces similar challenges in the entire belt.



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/nutrition, housing, basic sanitation, lifestyles, protection against environmental hazards and communicable diseases impact health, 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 includes sub-centers, primary health centres (PHCs), community health centres (CHCs), government district hospitals, availability of hospital beds at various levels, etc., while educational infrastructure provides comprises medical colleges, nursing and paramedical colleges, etc.

#### **4.1. Service Infrastructure**

Healthcare services are designed to meet health needs of communities through the use of available knowledge and resources. The purpose of these services is to improve health status of the population through reduction of morbidity and mortality, improve life expectancy at birth, low population growth rate, improvement in nutritional status, and basic sanitation.

##### **4.1.1 Sub-centres**

Sub-centre is the peripheral outpost of the existing health delivery system in rural areas. It acts as the first point of contact between the primary healthcare system and a 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 responsible for establishing regular communication and dissemination so as 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 by almost 40% from 30,052 during the 6<sup>th</sup> Plan to 42,331 during the 11<sup>th</sup> Plan. However, during the

same period its share in the overall number of sub-centres across India has declined from 35.62% to 28.58%, implying higher growth in the non-basin states. Within the Ganga Basin, in line with relative population/ area Uttar Pradesh accounts for a major proportion of sub-centres i.e. more than 48%, whereas Uttarakhand being thinly populated and smaller state accounts for only around 4%. Table 2 also shows that the number of sub-centres functioning in Uttar Pradesh and Uttarakhand has remained same during the 10<sup>th</sup> and the 11<sup>th</sup> Plans, while the number in the Ganga Basin as well as in India has increased over the same period . Bihar accounted for 22.69% of total sub-centres of the basin in the 11<sup>th</sup> Plan. The number of sub-centres in Bihar has gone up from 8299 in the 6<sup>th</sup> plan to 14799 in the 9<sup>th</sup> Plan. (The fall in numbers in Bihar between Ninth and Tenth Plans is due to bifurcation of the State) . In West Bengal, the number has increased constantly up to the 10<sup>th</sup> Plan and there was no addition during the entire 11<sup>th</sup> Plan period.

**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] |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|------------------------|-----------------------|-----------------------|------------------------|---------------------------|
| <b>Uttarakhand</b>                                                                                                                                                         | (--)                 | (--)                   | (--)                  | (--)                  | 1,765                  | 1,848                     |
| <i>UK % from Ganga Basin</i>                                                                                                                                               | (--)                 | (--)                   | (--)                  | (--)                  | 4.25%                  | 4.37%                     |
| <i>UK % from India</i>                                                                                                                                                     | (--)                 | (--)                   | (--)                  | (--)                  | 1.21%                  | 1.25%                     |
| <b>Uttar Pradesh</b>                                                                                                                                                       | 15,653               | 20,153                 | 20,153                | 20,153                | 20,521                 | 20,521                    |
| <i>UP % from Ganga Basin</i>                                                                                                                                               | 52.09%               | 47.06%                 | 47.06%                | 46.78%                | 49.39%                 | 48.48%                    |
| <i>UP % from India</i>                                                                                                                                                     | 18.55%               | 15.48%                 | 14.79%                | 14.68%                | 14.13%                 | 13.85%                    |
| <b>Bihar*</b>                                                                                                                                                              | 8299                 | 14799                  | 14799                 | 14799                 | 8,909                  | 9,606                     |
| <i>BR % from Ganga Basin</i>                                                                                                                                               | 27.62%               | 34.56%                 | 34.56%                | 34.35%                | 21.44%                 | 22.69%                    |
| <i>BR % from India</i>                                                                                                                                                     | 9.84%                | 11.37%                 | 10.86%                | 10.78%                | 6.13%                  | 6.49%                     |
| <b>West Bengal</b>                                                                                                                                                         | 6,100                | 7,873                  | 7,873                 | 8,126                 | 10,356                 | 10,356                    |
| <i>WB % from Ganga Basin</i>                                                                                                                                               | 20.30%               | 18.38%                 | 18.38%                | 18.86%                | 24.92%                 | 24.46%                    |
| <i>WB % from India</i>                                                                                                                                                     | 7.23%                | 6.05%                  | 5.78%                 | 5.92%                 | 7.13%                  | 6.99%                     |
| <b>Ganga Basin</b>                                                                                                                                                         | 30,052               | 42,825                 | 42,825                | 43,078                | 41,551                 | 42,331                    |
| <i>Basin % from India</i>                                                                                                                                                  | 35.62%               | 32.90%                 | 31.43%                | 31.37%                | 28.60%                 | 28.58%                    |
| <b>All India Total</b>                                                                                                                                                     | 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**

Over the years although an extensive infrastructure for medical and health services in the public and private sectors has been created, however, there is significant gap in supply and demand for the infrastructure for health services. Inadequacy of health infrastructure in terms of number of sub-centres in the Ganga Basin is presented in Table 3.

**Table 3: Requirement, availability and deficit in sub-centres in the three main state of Ganga Basin**

| State/ UT                                  | Requirement |        |        | Availability |        |        | Deficit |       |       |
|--------------------------------------------|-------------|--------|--------|--------------|--------|--------|---------|-------|-------|
|                                            | 2008        | 2010   | 2012   | 2008         | 2010   | 2012   | 2008    | 2010  | 2012  |
| <b>Uttarakhand</b>                         | 1294        | 1294   | 2341   | 1765         | 1765   | 1848   | *       | *     | 493   |
| <b>Uttar Pradesh</b>                       | 26344       | 26344  | 31037  | 20521        | 20521  | 20521  | 5823    | 5823  | 10516 |
| <b>Bihar</b>                               | 14959       | 14959  | 18533  | 8858         | 9696   | 9696   | 6101    | 5263  | 8837  |
| <b>West Bengal</b>                         | 12101       | 12101  | 13186  | 10356        | 10356  | 10356  | 1745    | 1745  | 2830  |
| <b>Ganga Basin</b>                         | 54698       | 54698  | 65097  | 41500        | 42338  | 42421  | 13669   | 12831 | 22676 |
| <b>India</b>                               | 158792      | 158792 | 189094 | 146036       | 147069 | 148366 | 20486   | 19590 | 43776 |
| <i>Note : *Surplus</i>                     |             |        |        |              |        |        |         |       |       |
| <i>Source: RHS Bulletin 2008,2010,2012</i> |             |        |        |              |        |        |         |       |       |

Table 3 shows that the existing sub-centres in the Ganga Basin as well as in India are inadequate to meet the requirement. For instance, in 2012 in Uttar Pradesh alone, there was a shortfall of 35% and which accounts for around 48% deficit when looked at the entire Ganga basin level.. It is significant to note that the Ganga Basin constituted about 62% of India's total shortfall of sub-centres.

It is also noted that the deficit is highest in Bihar at 48% followed by UP at 34%. Both Uttarakhand and West Bengal fare better with deficit of only 21% in 2012. Interestingly Uttarakhand reported surplus in 2008 and 2010. The high deficit in Bihar represents a rather serious situation .

#### **4.1.2 Primary Health Centre (PHC)**

PHC is the first point of contact between village community and a medical officer. It functions as health service institution with little community involvement. The PHCs are 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 supposed to cover 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 contract basis. It acts as a referral unit for 6 sub-centres and has 4 to 6 beds for admitting

indoor 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 6<sup>th</sup> Plan to 7279 in 9<sup>th</sup> Plan and thereafter the number declined to 6703 in the 11<sup>th</sup> 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 6<sup>th</sup> Plan to 28.06% in the 11<sup>th</sup> 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<br>[1981-85] | Seventh Plan<br>[1985-90] | Eighth Plan<br>[1992-97] | Ninth Plan<br>[1997-2002] | Tenth Plan<br>[2002-2007] | Eleventh Plan<br>[2007-2012] |
|------------------------------|-------------------------|---------------------------|--------------------------|---------------------------|---------------------------|------------------------------|
| Uttarakhand                  | (-)                     | (-)                       | (-)                      | (-)                       | 232                       | 257                          |
| <i>UK % from Ganga Basin</i> | (-)                     | (-)                       | (-)                      | (-)                       | 3.59%                     | 3.82%                        |
| <i>UK % from India</i>       | (-)                     | (-)                       | (-)                      | (-)                       | 1.04%                     | 1.08%                        |
| Uttar Pradesh*               | 1,169                   | 3,000                     | 3,761                    | 3,808                     | 3,660                     | 3,692                        |
| <i>UP % from Ganga Basin</i> | 37.26%                  | 47.99%                    | 52.00%                   | 52.31%                    | 56.64%                    | 54.93%                       |
| <i>UP % from India</i>       | 12.83%                  | 16.07%                    | 16.98%                   | 16.65%                    | 16.36%                    | 15.46%                       |
| Bihar*                       | 796                     | 2001                      | 2209                     | 2209                      | 1648                      | 1863                         |
| <i>BR % from Ganga Basin</i> | 25.37%                  | 32.01%                    | 30.54%                   | 30.35%                    | 25.50%                    | 27.72%                       |
| <i>BR % from India</i>       | 8.73%                   | 10.72%                    | 9.97%                    | 9.66%                     | 7.37%                     | 7.80%                        |
| West Bengal                  | 1,172                   | 1,250                     | 1,262                    | 1,262                     | 922                       | 909                          |
| <i>WB % from Ganga Basin</i> | 37.36%                  | 20.00%                    | 17.45%                   | 17.34%                    | 14.27%                    | 13.52%                       |
| <i>WB % from India</i>       | 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                        |
| <i>Basin % from India</i>    | 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

It may be noted that these PHCs came under criticism as they were not able to provide adequate health coverage partly due to ill-equipped staff and partly because of large population - exceeding one lakh in their catchments. Table 5 presents data on PHC which shows significant deficit across all states in the basin and across the country as well., Uttarakhand being an exception. In 2012 the deficit in the entire basin is 38% while that across the entire country is 26%. Among the three main states under considerations, West Bengal has highest deficit at 58%, followed by Bihar at 40% and UP at 29% respectively. Evidently the situation as regards availability of 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                                  | Requirement |       |       | Availability |       |       | Deficit |      |      |
|--------------------------------------------|-------------|-------|-------|--------------|-------|-------|---------|------|------|
|                                            | 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 |
| <b>Note: * Surplus</b>                     |             |       |       |              |       |       |         |      |      |
| <b>Source: RHS Bulletin 2008,2010,2012</b> |             |       |       |              |       |       |         |      |      |

### 4.1.3 Community Health Centre (CHC)

CHCs are established and maintained by the State Government under the MNP/BMS programme. As per central norms four medical specialists i.e. a surgeon, a physician, a gynecologist and a pediatrician supported by paramedical and other staff are required in each CHC. It serves as a referral centre for 4 PHCs and also provides facilities for obstetric (relating to childbirth) care and specialist consultations. One CHC covers 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 6<sup>th</sup> Plan to 988 in the 11<sup>th</sup> Plan (a more than six-fold rise). In Uttar Pradesh, the number has gone up significantly from 74 in the 6<sup>th</sup> Plan to 515 in the 11<sup>th</sup> 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 CHCs has

increased during the period under consideration. In the case of Bihar, the number of CHCs increased up to the 8<sup>th</sup> Plan, remained constant during the 9<sup>th</sup> Plan and then declined. While the decline in Bihar is attributed to bifurcation of the state. However, lack of growth in Bihar during the long period of the 8<sup>th</sup>, to 11<sup>th</sup> Plans can be attributed to poor governance. Interestingly during the same period when the state of UP was bifurcated, the two states of Uttarakhand and the rest of the UP have recorded considerable increase. A perusal of Table 6 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<br>[1981-85] | Seventh<br>Plan<br>[1985-90] | Eighth<br>Plan<br>[1992-97] | Ninth Plan<br>[1997-<br>2002] | Tenth<br>Plan<br>[2002-<br>2007] | Eleventh Plan<br>[2007-2012] |
|------------------------------|-------------------------|------------------------------|-----------------------------|-------------------------------|----------------------------------|------------------------------|
| <b>Uttarakhand</b>           | (-)                     | (-)                          | (-)                         | (-)                           | 49                               | 59                           |
| <i>UK % from Ganga Basin</i> | (-)                     | (-)                          | (-)                         | (-)                           | 5.76%                            | 5.95%                        |
| <i>UK % from India</i>       | (-)                     | (-)                          | (-)                         | (-)                           | 1.21%                            | 1.23%                        |
| <b>Uttar Pradesh*</b>        | 74                      | 177                          | 262                         | 310                           | 386                              | 515                          |
| <i>UP % from Ganga Basin</i> | 49.66%                  | 43.07%                       | 52.51%                      | 55.66%                        | 45.36%                           | 51.92%                       |
| <i>UP % from India</i>       | 9.72%                   | 9.27%                        | 9.95%                       | 10.15%                        | 9.54%                            | 10.71%                       |
| <b>Bihar*</b>                | 52                      | 147                          | 148                         | 148                           | 70                               | 70                           |
| <i>BR % from Ganga Basin</i> | 34.90%                  | 35.77%                       | 29.66%                      | 26.57%                        | 8.23%                            | 7.06%                        |
| <i>BR % from India</i>       | 6.83%                   | 7.70%                        | 5.62%                       | 4.85%                         | 1.73%                            | 1.46%                        |
| <b>West Bengal</b>           | 23                      | 87                           | 89                          | 99                            | 346                              | 348                          |
| <i>WB % from Ganga Basin</i> | 15.44%                  | 21.17%                       | 17.84%                      | 17.77%                        | 40.66%                           | 35.08%                       |
| <i>WB % from India</i>       | 3.02%                   | 4.55%                        | 3.38%                       | 3.24%                         | 8.55%                            | 7.24%                        |
| <b>Ganga Basin</b>           | 149                     | 411                          | 499                         | 557                           | 851                              | 992                          |
| <i>Basin % from India</i>    | 19.58%                  | 21.52%                       | 18.95%                      | 18.24%                        | 21.04%                           | 20.63%                       |
| <b>India</b>                 | 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 presents status of CHC availability across all the states in the Ganga basin. While it may be a consolation that the new state of Uttarakhand reported surplus in 2008 and 2010, but otherwise across the country and the entire Ganga basin the situation is rather alarming. Particularly in all the states while the requirements have gone up, however the availability has remained static over the period of 2008 to 2012, indicating complete lack of investment in this segment.

In 2012 while pan India deficit is 40%, it is 63% in the entire Ganga basin. Among the four states, in 2012 the deficit is highest in Bihar at 91% followed by UP at 60%, while West Bengal and Uttarakhand report deficit of around 35%.

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

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

*Note: \* Surplus*

*Source: RHS Bulletin 2008,2010,2012*

#### **4.1.4 Government 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 in 2011 out of the total government hospitals functioning in the country, only around 20% are working in the Ganga Basin and evidently this is not in proportion to the total population residing in the basin.

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 bed in a government hospital in the Ganga basin states. In 2011 while Uttarakhand presents a respectable ratio of one hospital for every 13,685 persons, the situation in UP (1 for 2,29,118), Bihar (1 for 4,51,325) and West Bengal (1 for 1,39,676) is rather alarming. On the whole the numbers represent a significant deficit in health infrastructure and need for major investments from government.

**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  |
| % of 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   |
| Uttarakhand   | 666             | 666   | 666   | 3746   | 3746   | 3746   | 29              | 29    | 29    | 4219   | 4219   | 4219   | 695             | 695   | 695   | 7965   | 7965   | 7965   |
| % of 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   |
| Bihar         | NA              | NA    | 61    | NA     | NA     | 1830   | NA              | NA    | 169   | NA     | NA     | 16686  | 1717            | 1717  | 230   | 22494  | 22494  | 18516  |
| % of 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  |
| West Bengal   | 99              | 14    | 364   | 5171   | 2399   | 13693  | 284             | 280   | 290   | 44510  | 52360  | 57498  | 383             | 294   | 654   | 49681  | 54759  | 71191  |
| % of 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  |
| Ganga Basin   | 1162            | 1195  | 1606  | 20827  | 21595  | 34719  | 841             | 655   | 834   | 69279  | 97513  | 119337 | 3720            | 1850  | 2440  | 112600 | 119108 | 154056 |
| % of 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 |

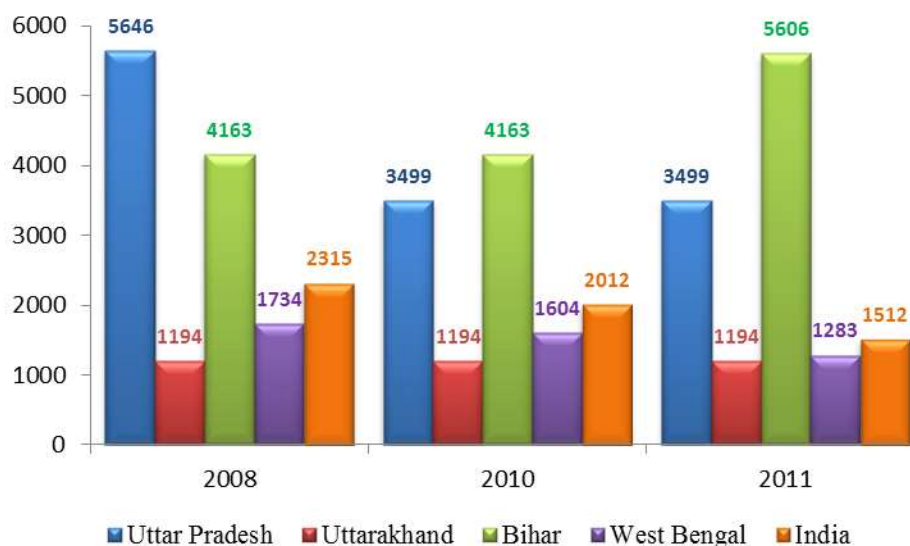
**Notes: Figures are for varying periods and thus are provisional and subject to change**

**Source: Directorate General of Health Services**



**Figure 2: Average Population Served Per Govt. Hospital**

Figure 3 shows state-wise average population served per hospital bed. It is observed that Uttarakhand and West Bengal have relatively better service levels in terms of number persons per bed compared to Uttar Pradesh and Bihar as well as even the national average. It is also observed that over 2008-2011 service levels in UP and West Bengal have, in Uttarakhand it has remained rather constant while in the case of Bihar it has woensened.



**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 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 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).

Availability of medical colleges in the basin is presented in Table 9. As evident from this set of data Uttar Pradesh has the highest number of medical colleges among the basin states followed by West Bengal Bihar and Uttarakhand. Out of total 32205 beds in the hospitals attached to the medical colleges of the basin, more than 50% were only in Uttar Pradesh. Student admission capacity in these 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

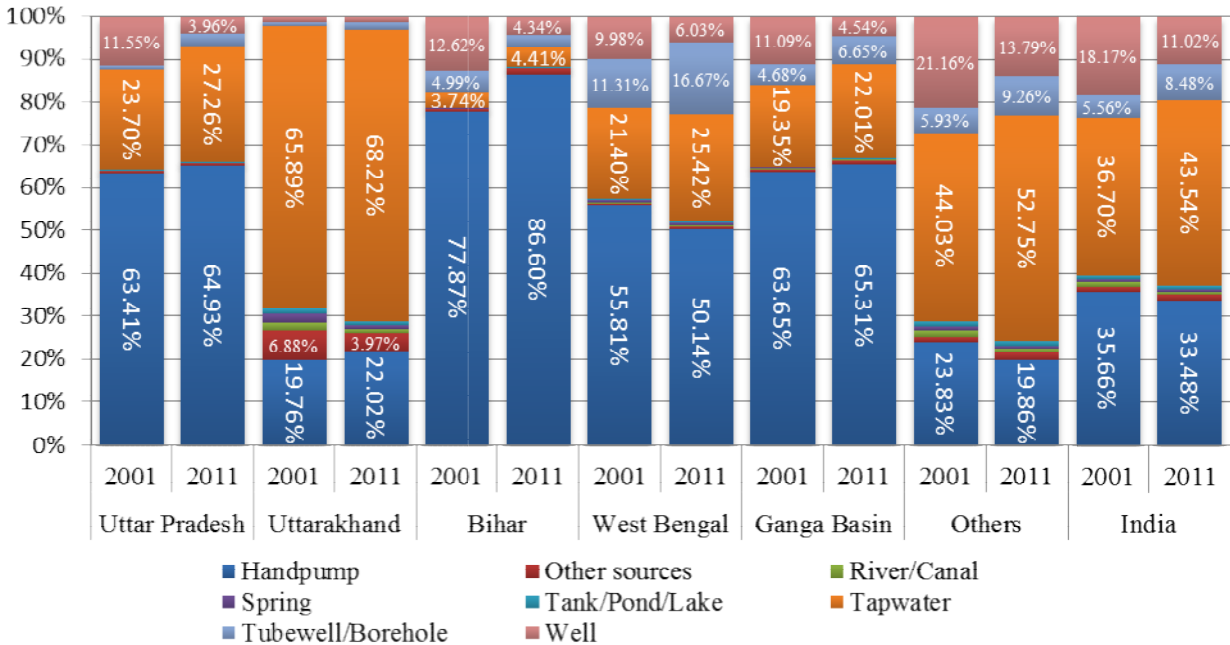
Supply of safe drinking water and provision of sanitation are the most important contributing factors for improving health of people. Faeces deposited near homes, contaminated drinking water (sometimes caused by poorly designed or maintained sewage systems), fish from polluted rivers and coastal waters, and agricultural produce, fertilized with human waste are all health hazards. Lack of water supply and poor sanitation are the primary reasons for wide prevalence of diarrhoeal diseases in developing countries (Park, 2011). As per a report from World Health Organization (WHO), 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 of age die in India due to water borne diseases. (IIMC Report on 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 percentage distribution of households by sources of drinking water in India and in the Basin States. While at all-India level, tap water with 44% households was the main source of drinking water ; in the Ganga Basin, hand pump was the main source as about 65% households depend on it. 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 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 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 & 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. As a result, 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 has been defined as the water which is free from pathogenic agents, harmful chemical substances; pleasant to the taste, i.e., free from colour and odour. 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 wide prevalence of the practice of open defecation, discharge of untreated sewage and insanitary conditions around 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 Table 9 (a). For instance, in Bihar, the number has gone up from 37.6% in 1981 to 94% in 2011. 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 to pollution of ground or surface water resources.

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

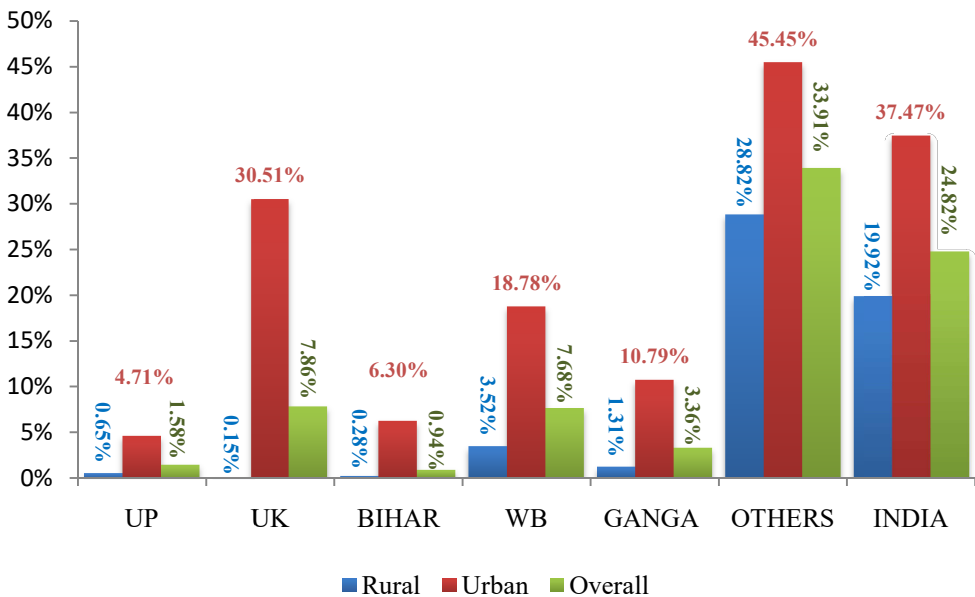
| Location      | 1981  |       |       | 1991  |       |       | 2001  |       |       | 2011  |       |       |
|---------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|               | Total | Rural | Urban | Total | Rural | Urban | Total | 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

Figure 5 illustrates proportion of households that used treated water by various means for drinking in the Ganga basin. More than 35% households in urban and not less than 20% in rural areas were reported to treat 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 access to treated drinking water. 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. On the whole it is noted that the condition was rather dismal in Uttar Pradesh and Bihar, more so among urban households where infrastructure is generally expected to be better.



Source: NSS 60<sup>th</sup> 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 depends on quality of raw water, cost of treatment and the desired output quality. Table 10 provides proportion of households treating water at point of use by various methods in the Ganga basin states and across the country. On the whole it is noted that this healthy practice is not as widely prevalent in the basin states as is the case across the country. For instance in the urban and rural areas of the basin states there are only 108 and 13

households per 1000 households which resort to some form of treatment as compared to the national average of 375 and 199 respectively.

Among the rural households practicing treatment at the point of use, the most common options comprise ceramic/sand filter, followed by boiling and cloth filter. On the other hand, among the practicing urban households it is intriguing to note that over two third have reported boiling as the preferred option which happens to be one of the safest from microbiological point of view but also involves highest operating costs. Higher preference to boiling can be attributed to higher concern of faecal contamination. In rural areas ceramic/ sand filter has been promoted by a number of agencies to combat problems of microbiological contamination as well as iron and manganese. It is interesting to note that a proportion of households even in rural areas have also installed relatively expensive RO and UV based compact commercial treatment units which again point towards higher level of awareness towards water quality and health impacts.

**Table 10: Proportion of Households Adopting Water Treatment at Point of Use, 2004**

| Region | Sectors | Ultra-violet/<br>resin/<br>reverse<br>osmosis | Filter | Boiling | Cloth<br>screen | Any<br>disinfectant | Others | No. HH/ 1000<br>Treating water<br>at point of use |
|--------|---------|-----------------------------------------------|--------|---------|-----------------|---------------------|--------|---------------------------------------------------|
| 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                                               |

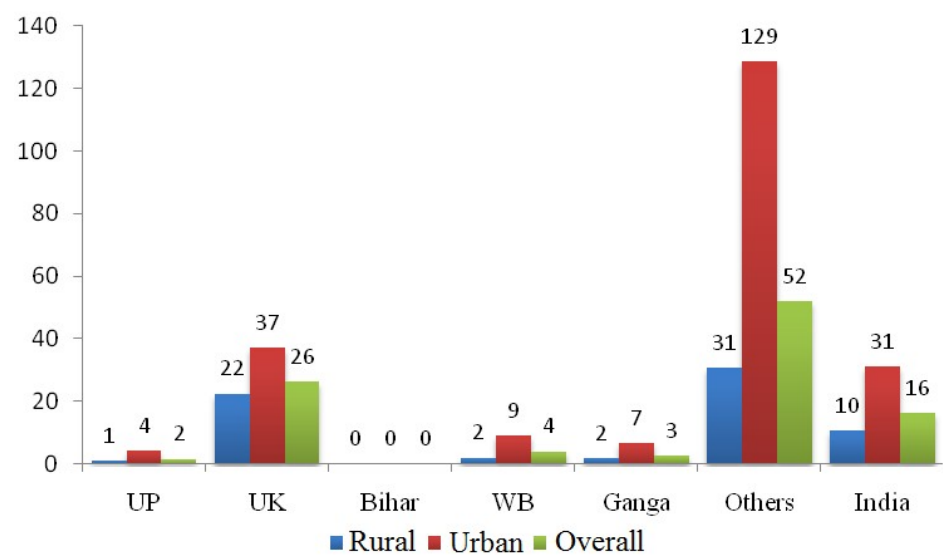
Source: NSS 60<sup>th</sup> round Unit level data, 'Morbidity, Health Care and the Condition of the Aged, Jan.-June, 2004

### 5.1.3 Bottled Water

The concept of safe drinking water has gained much importance in present scenario due to higher awareness for health. Apparently 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 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 industry. 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 distribution of households using bottled drinking water in rural and urban areas of the basin states. In the Ganga basin, there were only 0.3% households using bottled drinking water as compared to 1.6% all across India and 5.2% across the non-basin states. Among the urban households in the Ganga basin and non-basin states the usage is 0.7% and 12.9% respectively. Likewise among the rural households the usage in Ganga basin states is insignificant at 0.1% compared to non-basin states at 3.1%. As per NSS Report 2004, it is noteworthy that in Bihar bottled drinking water was not reported to in used. Low or no usage of bottled water is indicative of generally lower level of affordability among the large section of the basin population.



**Figure 6: Distribution of households (per 1000) using 'bottled' drinkingwater, 2004**

#### 5.1.4 Expenditure on Purified Drinking Water

Table 11 shows the distribution of surveyed households by type of treatment. Apart from traditional methods of water purification, some households in rural and urban areas also used RO and filters to treat 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.

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

| Regions | Sector | Types of water treatment                  |         |         |                 |                     |        |          |                    | Total Households |
|---------|--------|-------------------------------------------|---------|---------|-----------------|---------------------|--------|----------|--------------------|------------------|
|         |        | Ultra-violet/<br>resin/reverse<br>osmosis | Filter  | Boiling | Cloth<br>screen | Any<br>disinfectant | Others | Total    | Avg.<br>HH<br>size |                  |
| 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 60<sup>th</sup> round Unit level data, 'Morbidity, Health Care and the Condition of the Aged, Jan.-June, 2004

It is evident that a large number of households in the Ganga basin use various methods to treat drinking water at the point of use. All these measures entail certain costs on the user and among them RO represent the highest. It is estimated that installation of household level RO units alone would have involved a collective investment of approximately Rs. 1,52,100 million by households in the entire Ganga basin. Likewise, a ballpark estimate of total expenditure on bottled water in Ganga basin works out to be Rs.1,422.66 million (Rs.749.18 million in urban areas and 673.48 million in rural areas).

From the above, it can be concluded that people spend a considerable amount on drinking water to safeguard their families against water borne diseases. If expenditure summed up, the collective household expenditure on ROs and bottled water from in the Ganga Basin is about Rs.1,53,523 million. In this context, given the deteriorating quality of surface and ground water, it is noteworthy that the poor households suffer the most for their inability to bear the extra costs at the point of use.

## 5.2 Sanitation and Drainage

### 5.2.1 Access to Toilets

Collection and treatment of sewage and drainage is an issue that is closely associated with safety of water supplies. When sanitation is lacking, faecal contamination of water sources/ supplies can cause diarrhea, cholera, jaundice/ hepatitis, typhoid, and other water borne diseases.

The WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation defines “improved” sanitation as household latrine connection to a public sewer or septic system, a pour flush latrine, a simple pit latrine, or a ventilated improved pit latrine. These conditions necessarily mean that proportion of water closet (or, septic/ pour) /flushes latrine or at least pit latrine must increase along with a corresponding decline in proportion of households that have no latrine facility. For measurement of improvement in access to toilet facility this definition can work out. But in relation to water pollution and safety of drinking water, the types of latrine facility which does not contaminate groundwater or piped supplies is of importance.

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. It is noted that in 2011 nearly half of India’s 1.2 billion people did not have access to a toilet at home. Only 46.9% of the households possessed toilets, while 49.8% defecated in open. They squatted on roadsides, in agriculture fields or along 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.

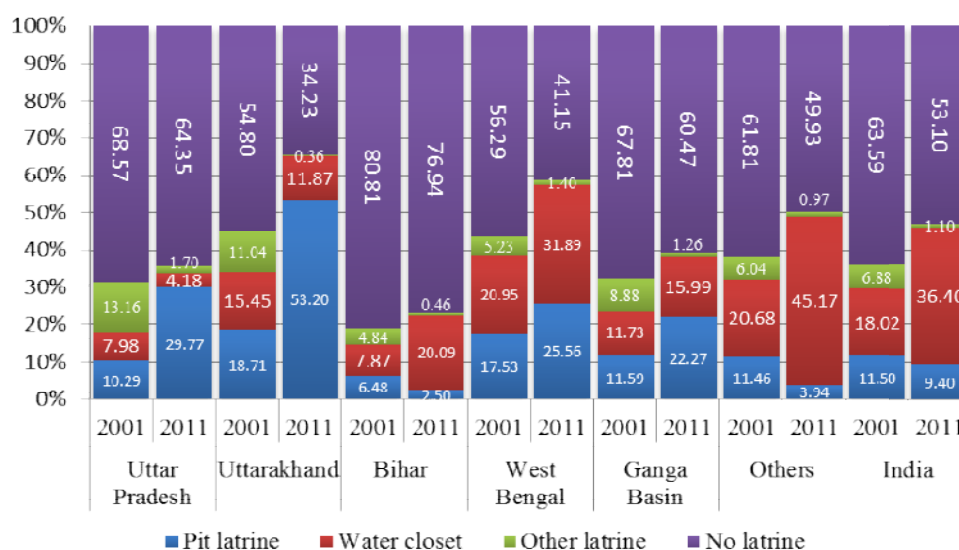
In contrast to the all India scenario the data in the Ganga basin is more alarming where in 2011 more than 60% of the households did not have access to toilet facility within premises. Among the states, Bihar is characterised by highest deficit at 75% followed by UP at 65% and West Bengal at 41%. Needless to say that the situation is rather alarming and requires very intense inputs towards behaviour change among both urban and rural sections of the population if public health has to be adequately safeguarded.

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

| State         | 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.

Figure 7 shows change in access to toilet in the Ganga basin over the last decade. It is noted that during this period the proportion of households having 'no latrines within premises' declined by only 7% in the basin states as compared to a fall of 10% across the country. Among the Ganga basin states, highest decline is observed in Uttarakhand (20%), followed by West Bengal, Bihar and Uttar Pradesh. This is attributed to intensive efforts at the national and state levels under the Total Sanitation Campaign and other urban sector programmes, however it is evident that there is still a long way to go before one can consider satisfactory level of sanitation in and around the urban and rural habitations in the basin states.

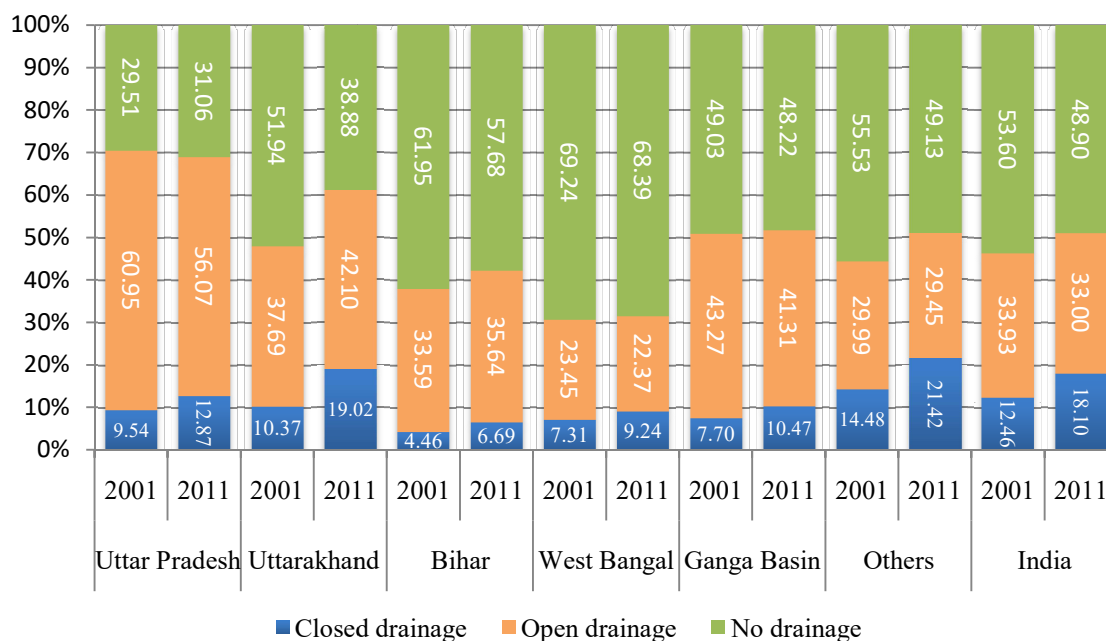


**Figure 7: Change in access to toilet during 2001-2011 in the Ganga basin**

### 5.2.2 Access to Sewerage and Drainage Facilities

Drainage has a significant impact on the hygiene practices and public health. 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 sewerage systems can typically reduce diarrhoeal incidence by about 30% or perhaps as much as 60% when baseline sanitation conditions are very poor. But in many contexts, sewerage might be less cost effective and less sustainable than onsite sanitation 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). Effective drainage of storm/ rain water from habitation areas is also critical for prevention of water based and water related diseases. In this regard, presence of efficient drainage and sewerage system should be considered as important factor in ensuring better public health in communities.

For analyzing India's scenario regarding sewage and sanitation condition, Census 2011 provides that at the country level, around 49% households did not have any drainage facilities; while 34% of households have only open drainage system and the rest have closed drainage. Figure 8 provides change and distribution of households by type of drainage system over the ten year period from 2001 and 2011. It is found that that more than 48% of the households have 'no drainage' in the Ganga basin as well as in non-basin states. Among the basin states, highest deficit is found in West Bengal (68%) followed by Bihar (58%).



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

## 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) (however this could be due to a variety of factors not restricted communicable water borne diseases only). The 60<sup>th</sup> 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 and presented in Figure 9. As per this the countrywide PAP is 99 while that in the Ganga basin is 117, indicating relatively higher level of ailment. Among the four states, West Bengal was found to have highest PAP at 157 while Uttarakhand with generally salubrious climatic conditions was found to have the lowest at 65. In general PAP in urban areas was found to be slightly higher than in rural areas across all geographical units. It is interesting to note that Bihar PAP data is almost similar to that of Uttarakhand indicating generally lower level of morbidity among the population.

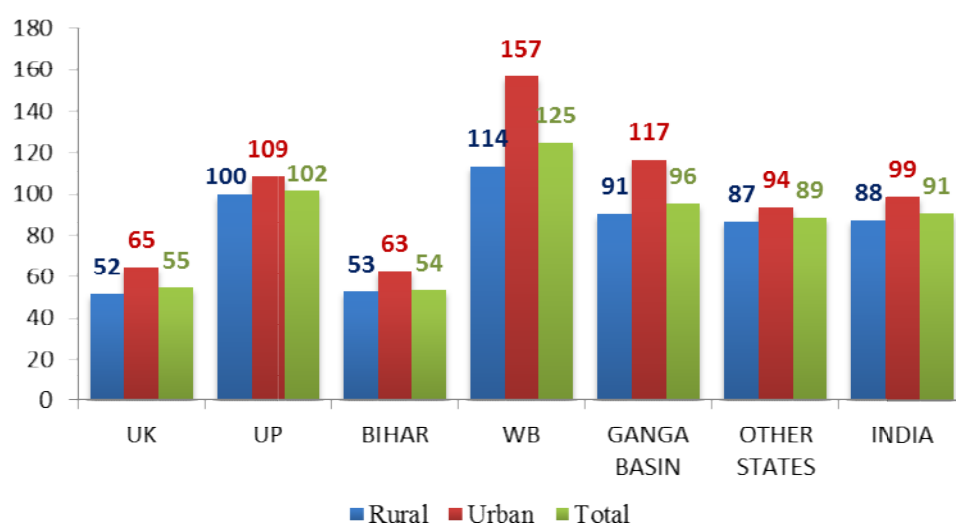
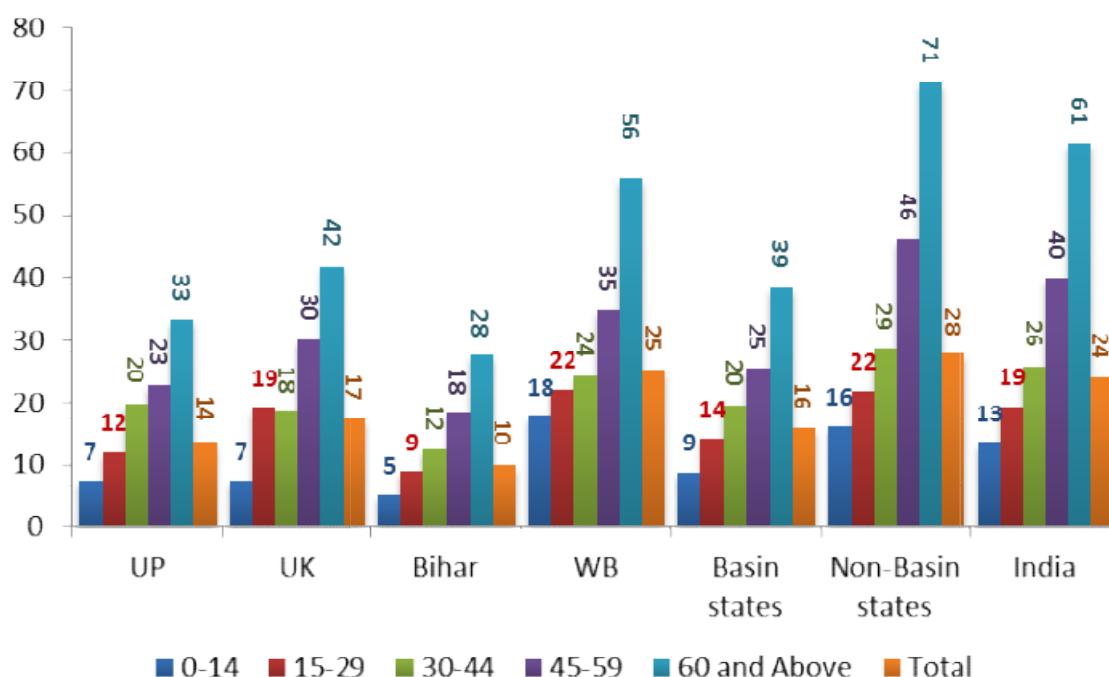


Figure 9: Proportion of ailing persons (per 1000) during a 15 days period, 2004

### 5.3.2 General Morbidity by Number of Persons Hospitalised

As per the 60<sup>th</sup> NSS round, an individual was considered hospitalised if he/she 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 presents number of persons hospitalised per 1000 population across rural and urban areas and age group in the Ganga basin

states. 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 for every 1000 population was recorded lowest in Bihar and highest in West Bengal. However, it is difficult to draw any conclusion from the above analysis regarding the status of health. Less cases of hospitalisation can be attributed to, among others, low access, unaffordability, etc. and not necessarily better public health.



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

**Figure 10: Number of persons (per 1000) hospitalised, 2004**

### 5.3.3 Water Borne and Water Related Diseases

The link between water and communicable diseases is well established and in general as shown in Box 1 it can be classified into four broad categories, viz., 'water borne', 'water washed', 'water based', and 'water related'. Water borne diseases are caused primarily due to ingestion of faecally contaminated water which is the main concern of this report. Water washed diseases are attributed to personal hygiene habits and the quality and quantity of water available to individuals for external cleaning. On the other hand the latter two diseases are mainly related to drainage of water/ wastewater.

### 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*

Appendix Table A 2 (refer, appendix Table A 2) presents number of persons hospitalised (per 1000 population) due to various ailments. Among others, the main diseases of concern in the context of this study in the Ganga basin are diarrhoea, gastroenteritis, hepatitis, and 'fever of unknown origin'. Overall hospitalisation cases due to 'diarrhoea/dysentery' in the rural and urban areas in the entire Ganga basin states are 12% and 9% respectively. In rural areas, due to poor health services and diagnosis, reporting of 'fever of unknown origin' is very common however it can be correlated to one or the other form of waste borne disease or viral infection. Estimates shown in the Table A2 bring out relatively higher incidence of diarrhoeal diseases in the Ganga basin states as compared to the non-basin states. Among the four basin states Bihar and West Bengal and urban areas of Uttar Pradesh experience relatively higher morbidity due to this disease.

The influence of water related diseases can also be examined through number of cases of deaths, provided by National Health Profile of India. As per the data presented in the Appendix Table A3 it is found 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.

**Acute diarrhoeal diseases:** during the 6 year period from 2005 to 2011 the number of cases in the basin states rose by 74% from 1.5 million to 2.6 million. During the same time interval, across the basin the reported cases of death are 622 and 499 respectively.

**Enteric Fever (Typhoid):** Most of the cases and deaths are found in the Ganga Basin states. While data on Bihar is not available but among the rest of basin states, maximum cases are reported from West Bengal, followed by Uttar Pradesh and Uttarakhand.

**Viral Hepatitis (All Causes):** Out of the total cases of viral hepatitis, 24% cases were reported in the Ganga basin during 2009, which is the highest since 2001. Ganga Basin accounted for about 27% of total deaths due to viral hepatitis in India (UNDP, 2006). Table A3 describes the incidence and fatal consequence due to the water borne and vector borne (water based or water related) diseases.

**Japanese Encephalitis:** It is caused by 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. 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 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 was a decline 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 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. However, in 2005 in West Bengal, dengue cases increased to 54% and which also resulted in 34 deaths.

### 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

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 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 intensity of water bone diseases and consequently financial burden of diseases on 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 Table 14 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 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.

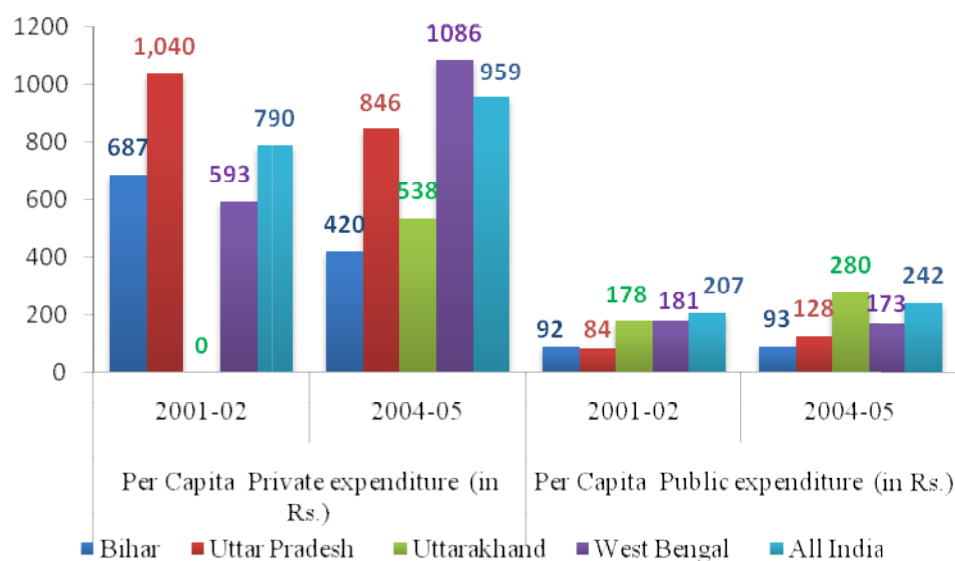
States within the Ganga basin also show similar trends. For example, proportion of Bihar in the overall health expenditure of the basin fell from 20.53% in 2001-02 to 13.70% in 2004-05 and that of Uttar Pradesh fell from 59.27% to 52.31% during the same years, while share of Uttarakhand and West Bengal 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 a 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       |
| <b>Uttar Pradesh</b> | 174,025,330                      | 14,088,564 | 188,113,894 | 151,006,063 | 22,805,122 | 173,811,185 |
| <b>% from basin</b>  | 62.28%                           | 37.10%     | 59.27%      | 53.13%      | 47.44%     | 52.31%      |
| <b>% from India</b>  | 21.27%                           | 6.57%      | 18.22%      | 14.46%      | 8.67%      | 13.30%      |
| <b>Uttarakhand</b>   | 0                                | 1,523,325  | 1,523,325   | 4,852,994   | 2,520,531  | 7,373,525   |
| <b>% from basin</b>  | 0.00%                            | 4.01%      | 0.48%       | 1.71%       | 5.24%      | 2.22%       |
| <b>% from India</b>  | 0.00%                            | 0.71%      | 0.15%       | 0.46%       | 0.96%      | 0.56%       |
| <b>Bihar</b>         | 57,455,419                       | 7,708,790  | 65,164,209  | 37,256,449  | 8,264,168  | 45,520,617  |
| <b>% from basin</b>  | 20.56%                           | 20.30%     | 20.53%      | 13.11%      | 17.19%     | 13.70%      |
| <b>% from India</b>  | 7.02%                            | 3.60%      | 6.31%       | 3.57%       | 3.14%      | 3.48%       |
| <b>West Bengal</b>   | 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 over time per capita public and private health expenditure in India has increased. At the all India level public expenditure is found to be about 25% of the private expenditure, the latter being in the range of Rs. 790 to Rs. 959. Among the basin states while Bihar and UP have reported fall in private expenditure, there is sharp rise in the case of West Bengal. On the other hand on public expenditure side there was a general rise except in the case of West Bengal which recorded a marginal drop of 4%.



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 health sector in Ganga Basin states and India. It is noted that the budgetary allocation on the health sector in the basin has increased by 300% from Rs.4,908 crores during the 10<sup>th</sup> Plan to Rs.20,098 crores during the 11<sup>th</sup> Plan. Intriguingly,

during the same period there was decrease of 20% in the case of Bihar (from Rs.1079 crores to Rs. 873 crores), while in all other states it increased substantially ranging 275% to 450%.

**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      |
|---------------------------------------------------------------------|---------------|----------------|---------------|---------------|----------------|----------------|
| <b>10th Plan<br/>(2002-2007)</b>                                    | <b>107920</b> | <b>240543</b>  | <b>38767</b>  | <b>103618</b> | <b>490848</b>  | <b>2176734</b> |
| 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         |
| <b>11th Plan<br/>(2007-12 )</b>                                     | <b>87254</b>  | <b>1319405</b> | <b>214882</b> | <b>388301</b> | <b>2009842</b> | <b>6103802</b> |
| 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        |
| <b>Source: National Health Profile of India Reports (2005-2011)</b> |               |                |               |               |                |                |

Table 16 shows 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 11<sup>th</sup> 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 in the case of Uttarakhand it was only 39%.

**Table 16: Proportion from All India Budgetary Allocation Under Health Sector (10<sup>th</sup> and 11<sup>th</sup> Plan)**

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

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

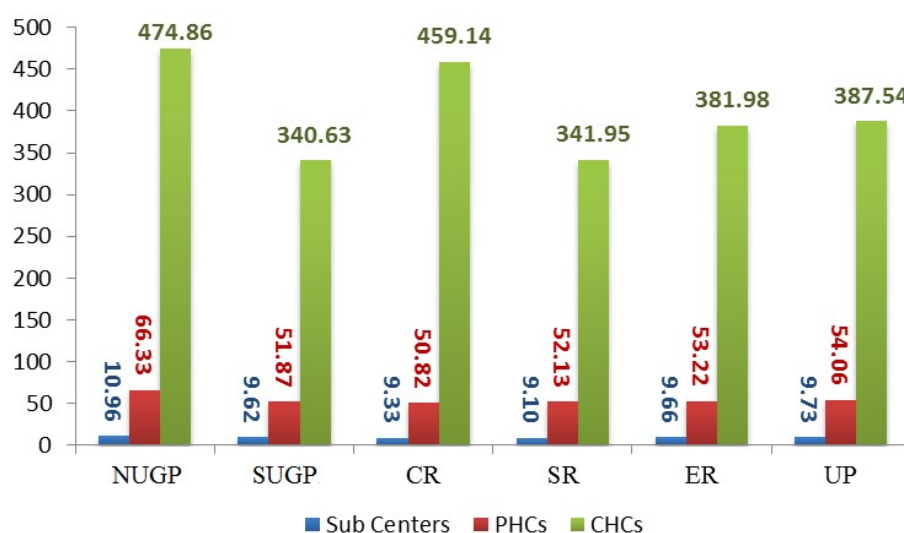
## PART II: DISAGGREGATED ANALYSIS

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 terms of area and population, it has been divided into five regions for 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

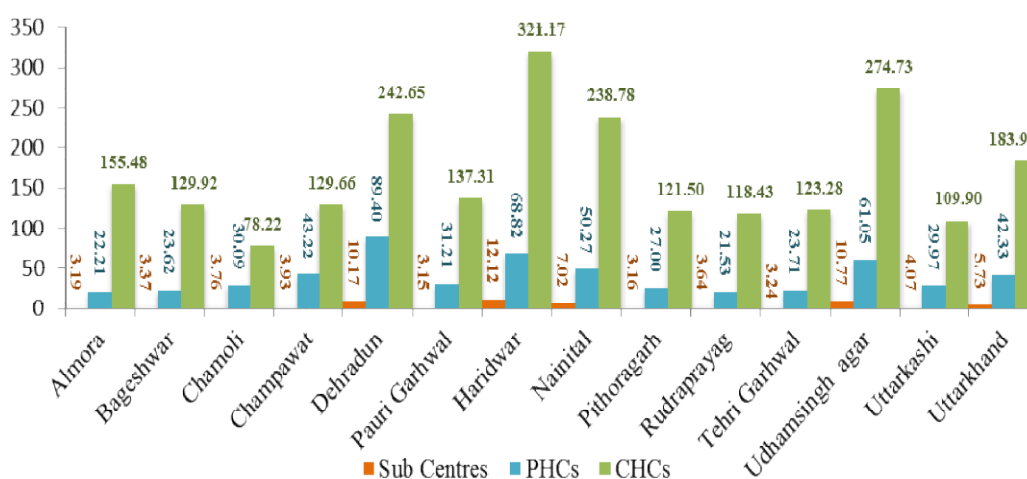
Figure 12 shows region-wise number of persons served per sub-centre, PHC, and CHC in Uttar Pradesh. According to the norms prescribed in the RHS bulletin (2012), a sub-centre is expected to serve 5000 persons in plain areas and 3000 persons in hilly areas but in Uttar Pradesh, one sub centre was serving more than 9000 persons in all the regions. The number of persons served per sub-centre was observed highest in NUGP, followed by ER (eastern region) and SUGP. Similarly, an average PHC in all the regions of the state was found to be over-loaded than the norm (One per 30 thousand). NUGP with 66.33 thousand per PHC was the highest) and CR with 50.82 thousand per PHC was the lowest. In the case of CHC also, the number of persons served was much higher than the norm (1.20 lakh) and the overload was in the range of 3.8 to 4.75 lakh. Across various regions. Evidently public healthcare infrastructure in all the regions of the state is overloaded and quite inadequate to meet requirement.



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

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

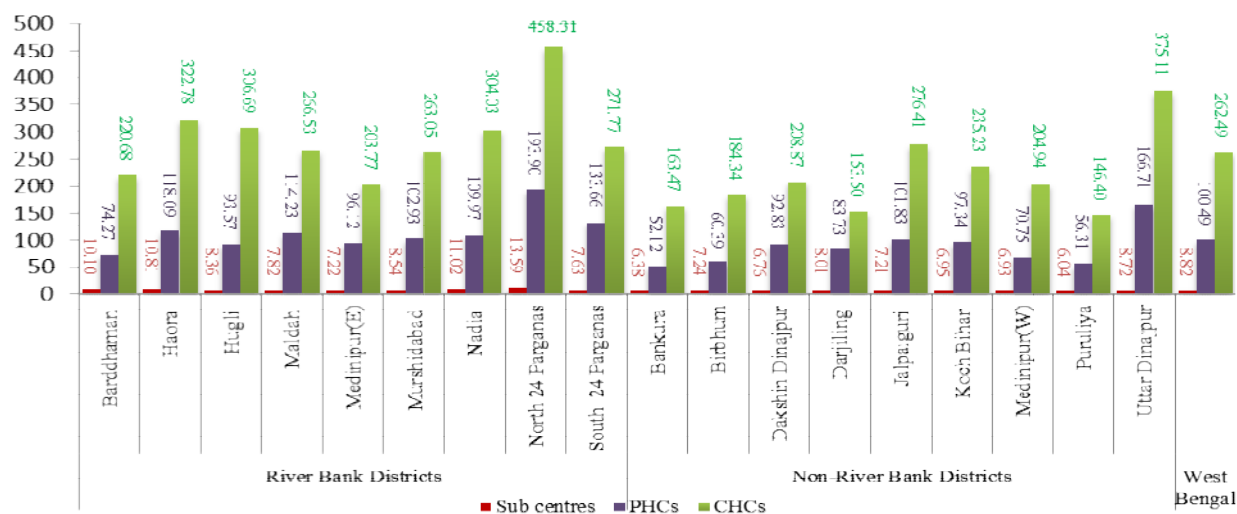
Figure 13 shows district-wise number of persons served per sub-centre/PHC/CHC in Uttarakhand in 2011. The Figure depicts that an average sub-centre in the districts of plain/semi-plain areas of the state (Dehradun, US Nagar, Haridwar and Nainital) served more number of people than that in the districts of hill areas of the state. It is evident 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 which can be attributed to lower population density in the hills. The same trend has been observed in the case PHC and CHC. For example, as against 89.40 thousand /PHC in Dehradun versus only 21.53 thousand/PHC in Rudraprayag; and 321 thousand/CHC in Haridwar versus (78 thousand/CHC in Chamoli.



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

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

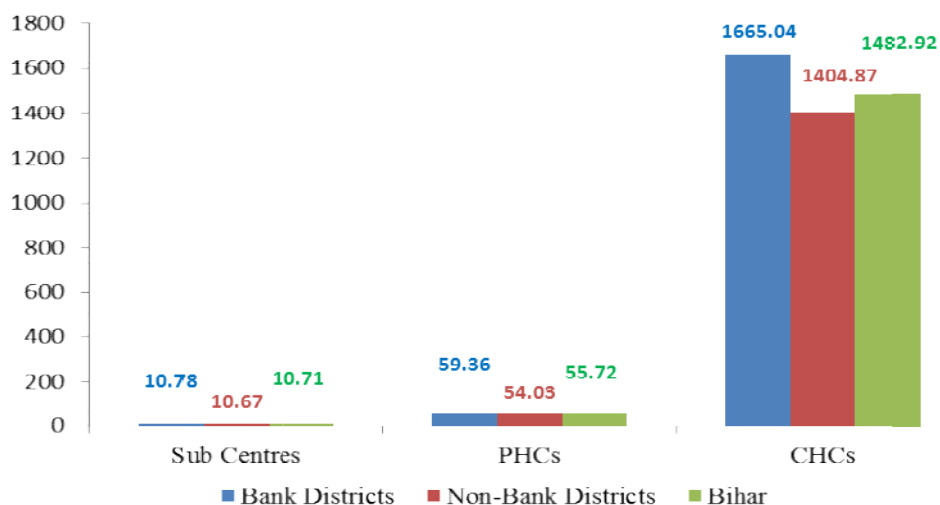
In the case of West Bengal, in general it is found that there are more number of persons per sub-centre, PHC and CHC in the river bank districts compared to the non-river bank districts. Figure 14 presents districtwise distribution for each type of facility. In West Bengal also, the public healthcare 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 15 portrays the scenario in Bihar during 2011. Here the load on CHCs was more alarming for 'bank districts' than 'non-bank districts'. For instance, there are 16.7 lakh persons served per CHC in 2011 as against the central norm of 1.2 lakh. As regards sub-centre and the PHCs there was no discernible difference between the 'bank districts' and non-bank districts', though there also overloading was recorded. For instance one sub-centre was serving an average of 10.7 thousand persons and one PHC was serving between 54-59 thousand persons.



**Figure 15: District-wise Population ('000) served per Sub-centre PHC, CHC in Bihar, 2011**

## **7. 2 Health Educational and Hospital Infrastructure**

In addition to the government hospitals at various levels, there are hospitals attached to medical colleges which also offer out- and in-patient services and play a crucial role in providing tertiary medical services. Appendix Table A5.1 to A5.4 present number of government and private colleges in various districts in the four states of Ganga basin along with the aggregate number of bed for in-patient admissions.

It is noted that in the case of UP tertiary healthcare facility is fairly widely distributed among various districts. Total hospitals are 15 and total bed capacity is close to 18,000 and is highest among all the four states. In this respect in relation to the total state population Bihar and West Bengal with total bed capacity of close to 6000 rank far behind and which may not be adequate to meet the requirements of the population.

Uttarakhand with 4 medical colleges And total bed capacity of 2350 appears to be reasonably equipped.

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.

## **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 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 plains. 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 households' access to safe drinking water.

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 constituted main sources of drinking water. Now hand pumps very often face crisis when water 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. Again more water consumption leads to rapid use of shallow pumps in summer leading to fall in ground water level and chances of contamination with poisonous substances like Arsenic. Currently in West Bengal most of the areas under river bank districts e.g., Nadia, North 24 Parganas, Murshidabad & Maldah and some parts of Hooghly and South 24 Parganas are highly affected with Arsenic in ground water. Given the high usage of hand pumps in West Bengal e.g., 77% in Murshidabad and 67% Nadia - the two major arsenic hit districts, it would be appropriate to investigate propensity of people to adopt purification and filtration process for drinking water purpose.

As in the case of UP and West Bengal, Figure 18 shows that in Bihar also hand pump is the major source of drinking water. In 2011 it was found that almost 89% of total households are using hand pump for drinking water followed by 4% using tap water and equal percentage using well water. The situation becomes complex due to shallow groundwater and therefore use of shallow hand pumps and the extremely low level of sanitation coverage across the state. As a result, people in rural as well as in urban areas of Bihar are more prone to water borne 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 and the pattern in Uttarakhand is presented in Figure 19. As per this, it is noted that in 2011 over 79% households use tap water after treatment. Dehradun being the most urbanised in the state the community here is most conscious about health and this is reflected in highest percentage of households (over 91%) using treated tap water for drinking purpose.

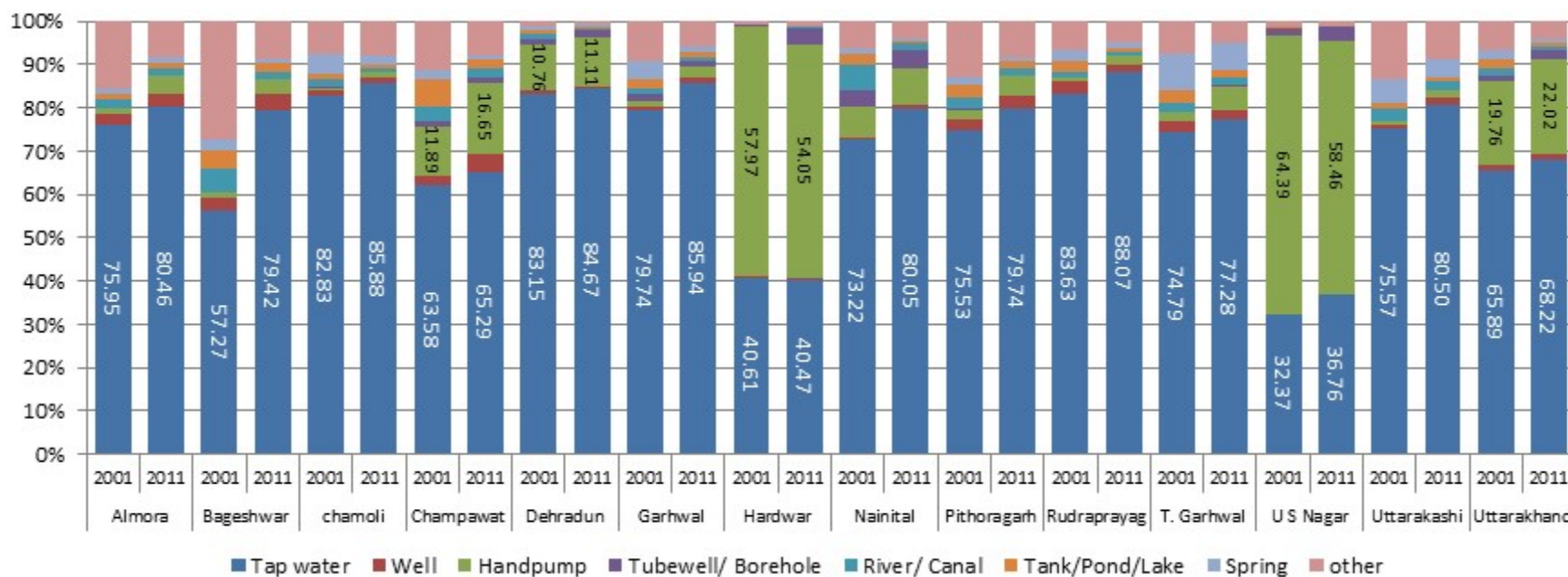


Figure 15: Distribution of Households by Main sources of Drinking water, Uttarakhand (2011)

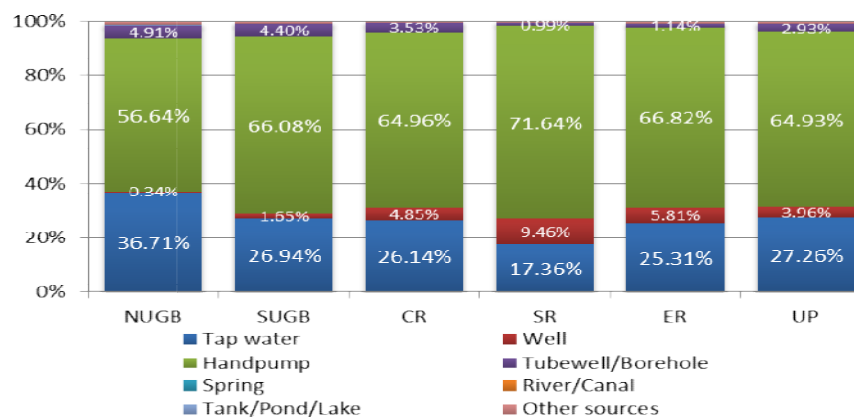


Figure 16: Distribution of Households by Main sources of Drinking water, Uttar Pradesh (2011)

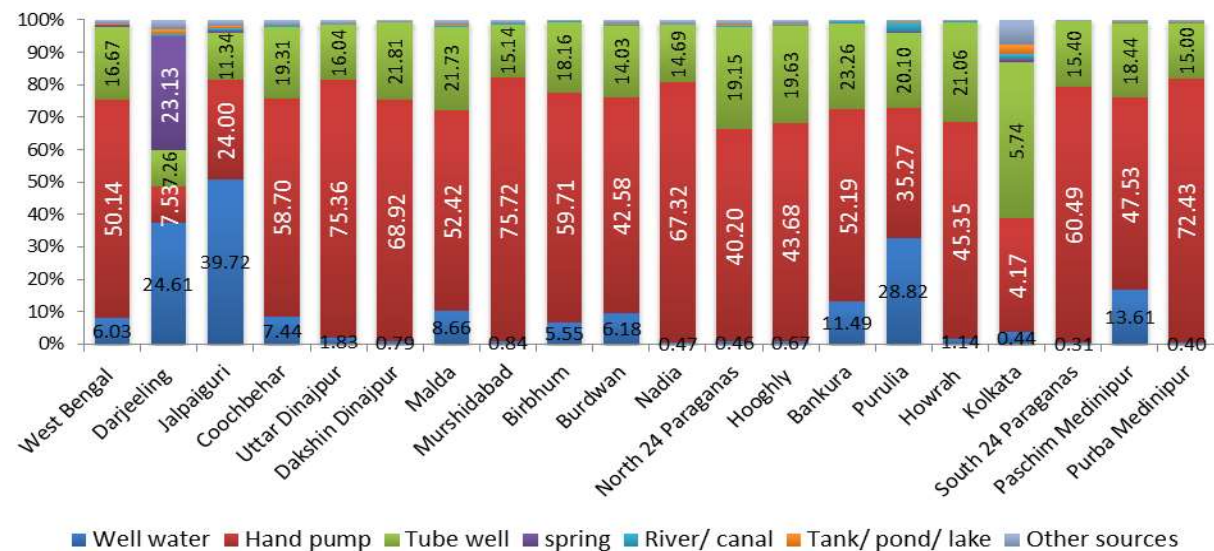


Figure 17: Distribution of Households by sources of Drinking water in West Bengal, 2011

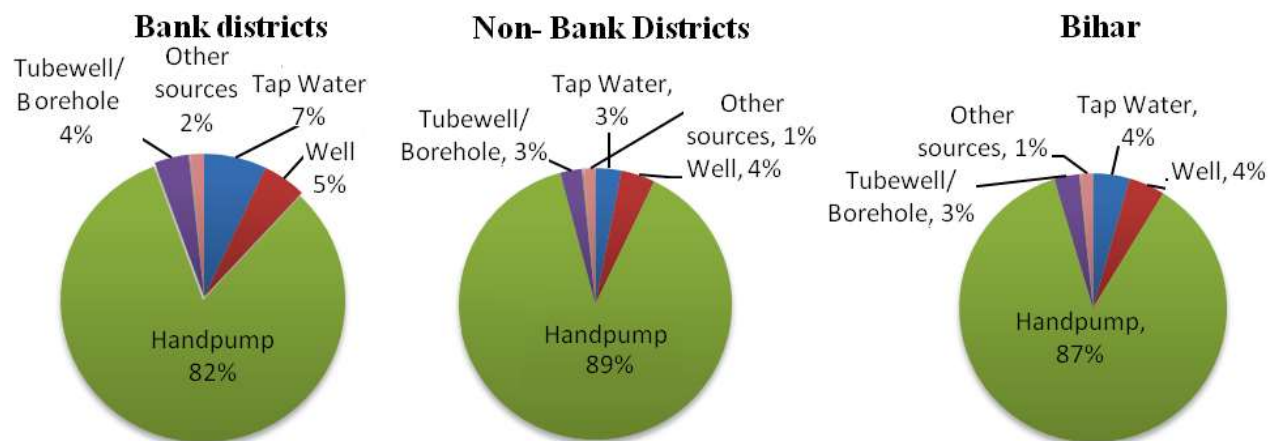
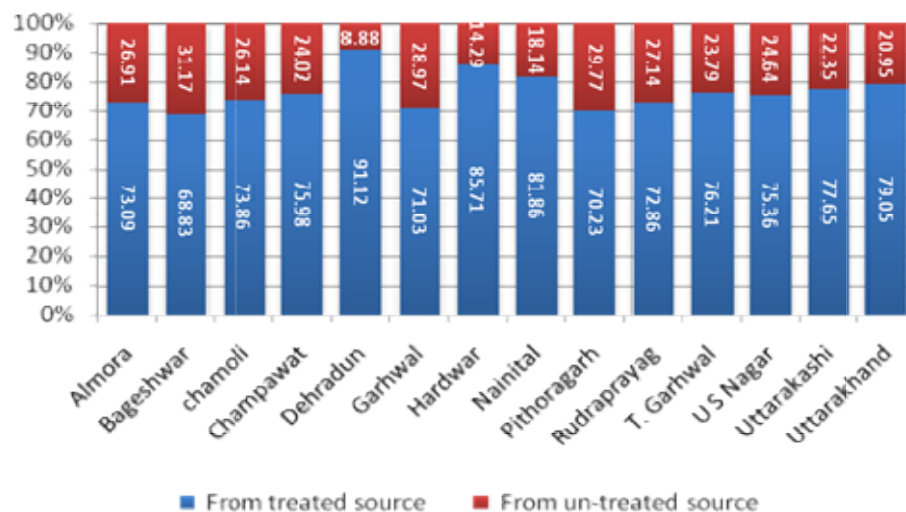
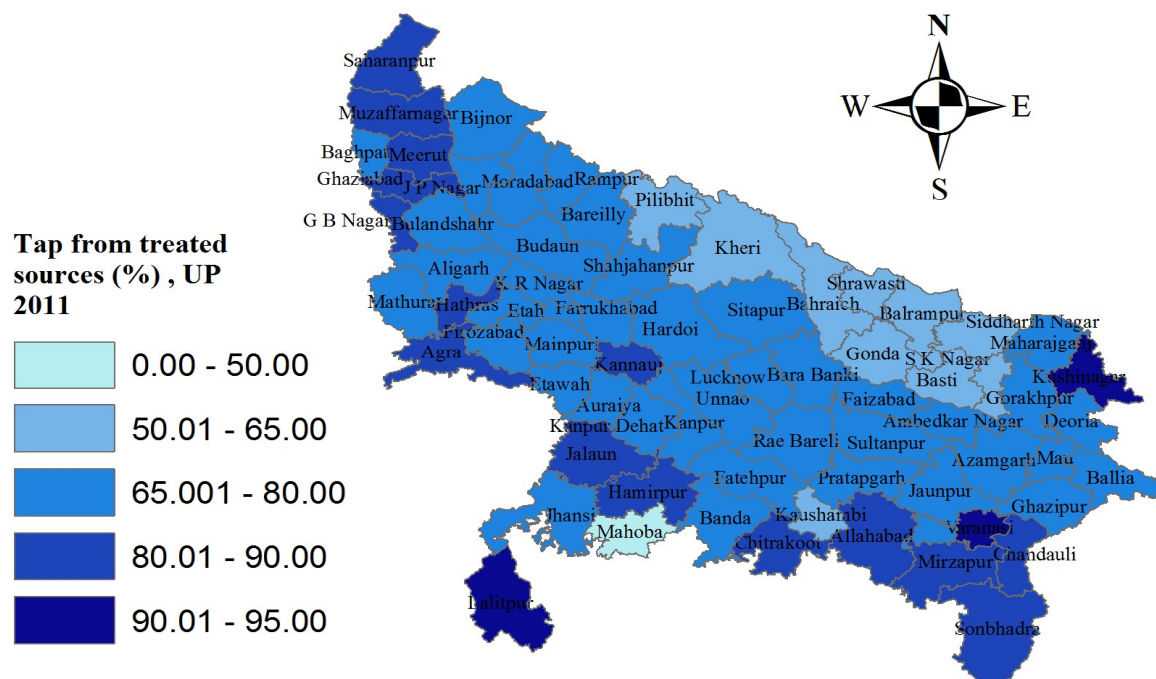


Figure 18: Distribution of Households by sources of Drinking water in Bihar, 2011



**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. Only in 10 districts, percentage of such households was less than 50. Lalitpur, Varanasi and Kushinagar districts had the highest proportion of households (90-95%) using tap water from treated sources.



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

Figure 20 shows 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 used untreated tap water respectively. The situation in Nadia is very critical given the intensity of ground water contamination.

Figure 21 shows percentage distribution of households using tap water from treated and untreated sources in Bihar. It is found that bank districts had slightly higher percentage of households using tap water from treated sources than non-bank districts.

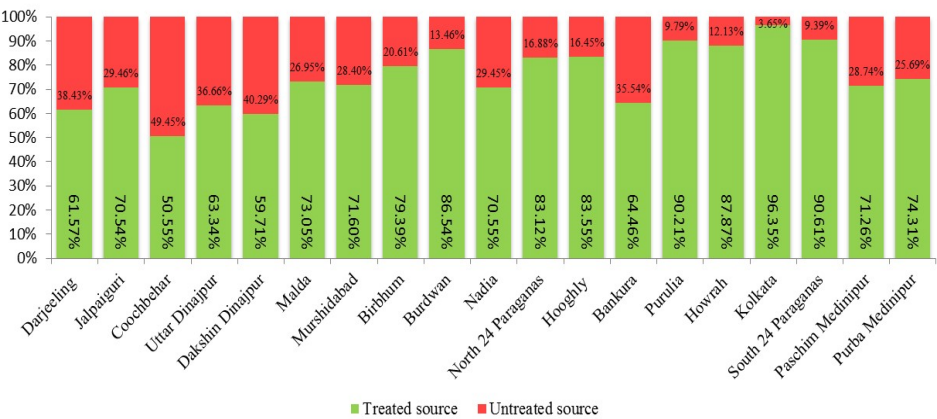


Figure 20: Distribution of Households by sources of Tap Water (treated) in West Bengal, 2011

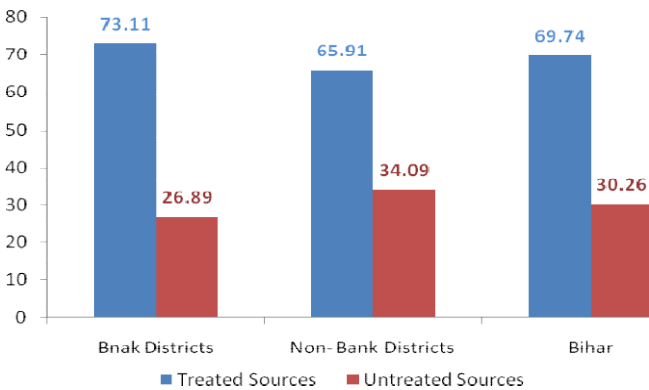


Figure 21: Distribution of Percentage of Households using Tap water from treated and Untreated Source in Bihar, 2011

### 8.1.1. Purified Water and 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). The percentage share of households using R-Os – an expensive option for water purification was much higher in urban than rural areas in all the regions, except ER where proportion in rural households was higher. 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 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/<br>resin/reverse<br>osmosis | Filter | Boiling | Cloth<br>screen | Any<br>disinfectant | Others | No. per 1000<br>Treating water<br>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 60<sup>th</sup> round Unit level data, ‘Morbidity, Health Care and the Condition of the Aged, Jan.-June, 2004

The NSS 60<sup>th</sup> 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, i.e., Haridwar was evaluated to analyse 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 methods 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 households in Bihar are concerned, Appendix Table A7 shows that a majority of them did not treat water at the point of use. At the state level only 6.3% of urban households and 0.30% of rural households use 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, in all other districts not even a single household was found to use R-O treatment at point of use. This exceptionally low prevalence of treatment at point of use can be attributed to, among others, low awareness, lack of concern and possibly low level of affordability.

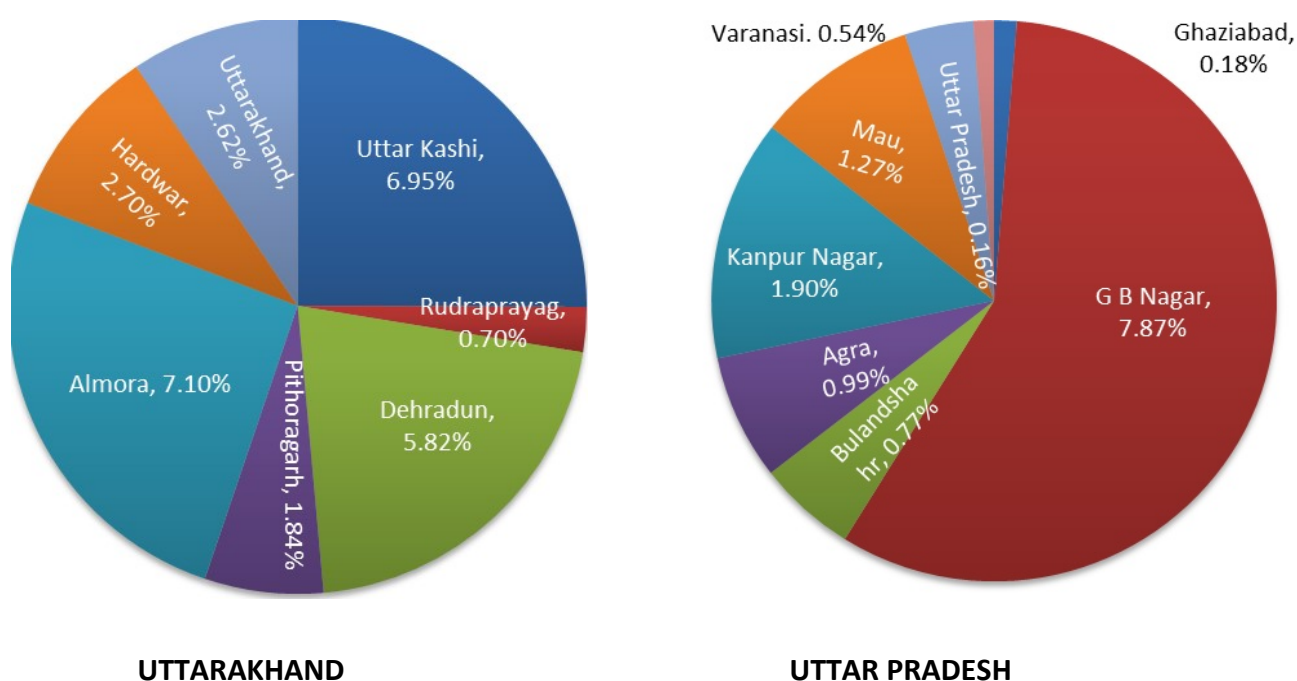
In West Bengal 188 urban households and 35 rural households per 1000 used water treatment at point of use. In urban areas, number of households treating water at point of use (per 1000) was found highest in Medinipur district (366), followed by Bankura District (324) and Murshidabad (304). In rural areas, it was observed to be highest in Bankura (125), followed by Howrah (94) and Jalpaiguri (61). On an average, in urban areas, domestic ceramic 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 the case of RO, the percentage was higher in urban than in rural areas which is evident considering higher affordability among the former. 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%). However, in more than 50% districts of the state, urban households did not use RO. In rural areas, except for a few districts, in a majority of other districts, RO was not used by the households.

### **8.1.2 Bottled Water**

Failure to provide municipal supply often affects the poorest populations either by leaving them to pay inflated prices for water provided by private vendors or compelling them to use unsafe 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 for drinking. 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 60<sup>th</sup> NSS Round (2004-05), only in 7 districts of the state (refer, Figure 22-b) households have

reported use of bottled water. These districts and the percentage of households using bottled water are Gautam Budha Nagar/Noida (7.87%), Kanpur Nagar (1.90%), Mau (1.27%), Agra (0.99%), Bulandshahr (0.77%), Varanasi (0.54%) and Ghaziabad (0.18%). Evidently poor quality of water supply/sources, increasing awareness and concern for health, rising income of households, among others can be attributed to be some of the main reasons for use of 'Water Bottles'. Relatively higher usage of bottled water in Noida is not surprising, given that it is an extension of Delhi and is characterised by relatively high income community and at the same time rather poor quality of water supply.

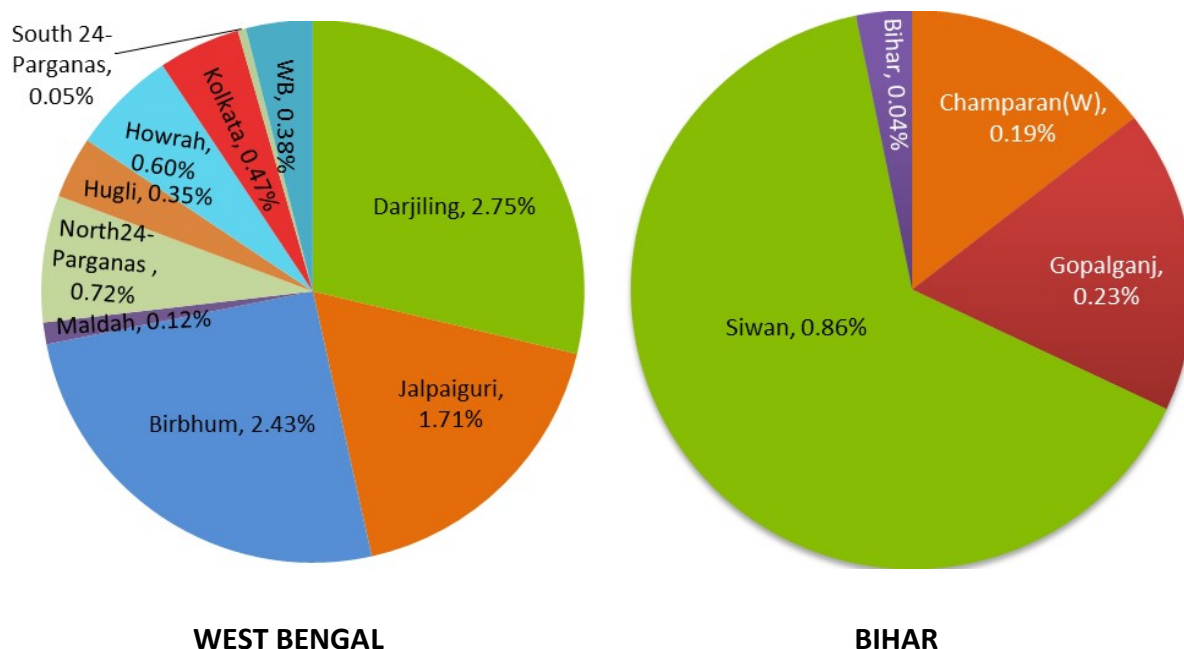


Source: NSS unit level data 60<sup>th</sup> round 'MORBIDITY AND HEALTH CARE', 2004

**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 for drinking in 9 out of total 18 districts. Among all the households using bottled water, highest share was in Darjiling (2.75%), followed by Birbhum (2.43%) and Jalpaiguri(1.71%). On the other hand in the case of Bihar there are only three districts (Refer, Figure 23-b) where it is used. Among these districts, Siwan (0.86%) occupies highest proportion followed by Gopalganj (0.23%) and West Champaran (0.19%). It is interesting to note that in Bihar usage of bottled water was reported only in rural areas and it is rather intriguing that none of the urban households (not even in state capital)

reported use of bottled water for drinking water . This is rather anomalous and can be attributed to error in sampling or data collection and analysis.



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

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

## 8.2 Access to Toilets

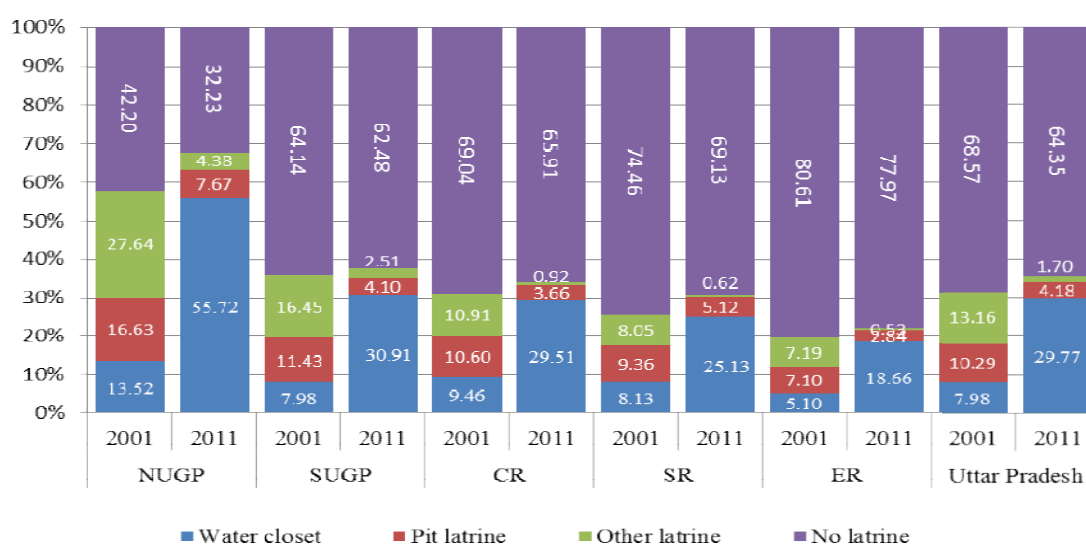
Figure 24 shows that in all the regions of Uttar Pradesh, percentage of households without toilet facilities has declined in 2011 over 2001, however considering the extent of the problem the decline can be termed as marginal. For instance in most of the regions the decline was only 1% to 3% except for 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 followed by SR at 69%, CR at 65% and SUGP at 63%. WR (NUGP + SUGP) offers encouraging situation where the deficit in 2011 is reported to be about 32%.

Figure 25 illustrates 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. 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 status 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**

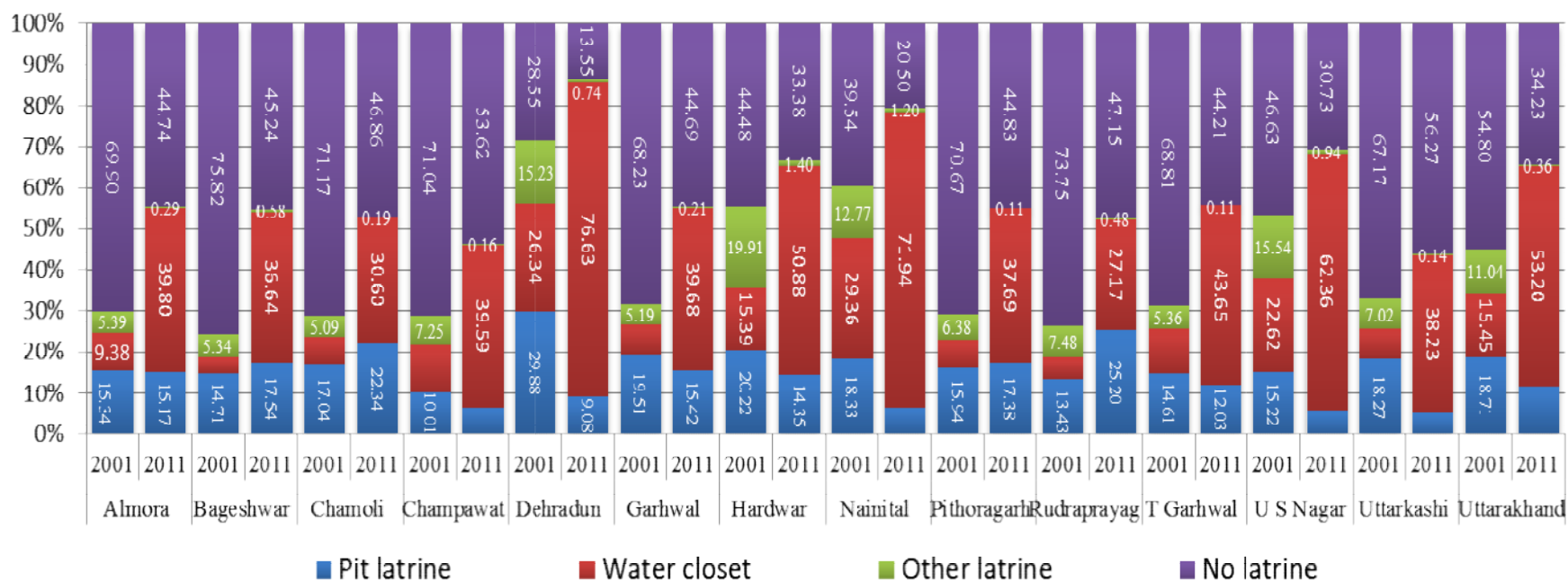
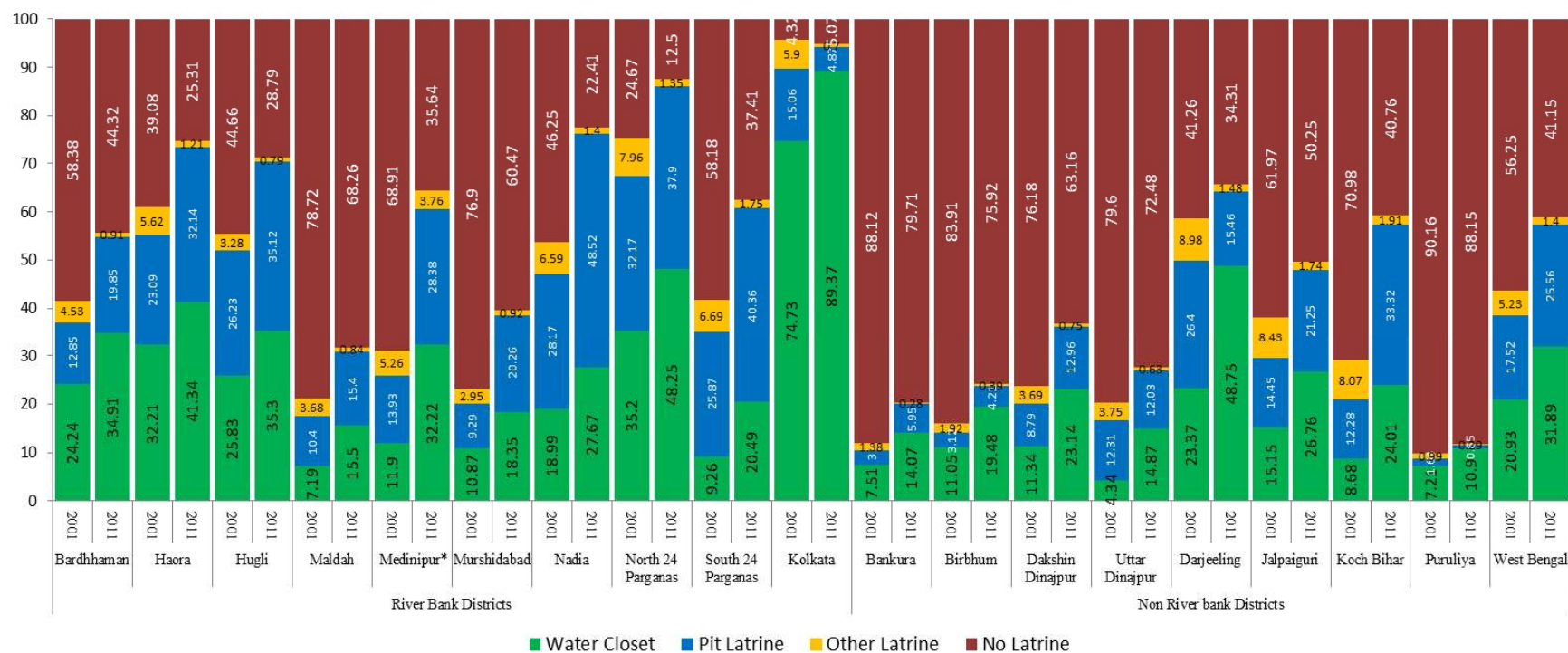


Figure 25: Distribution of Households by Main sources of Latrine, Uttarakhand



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

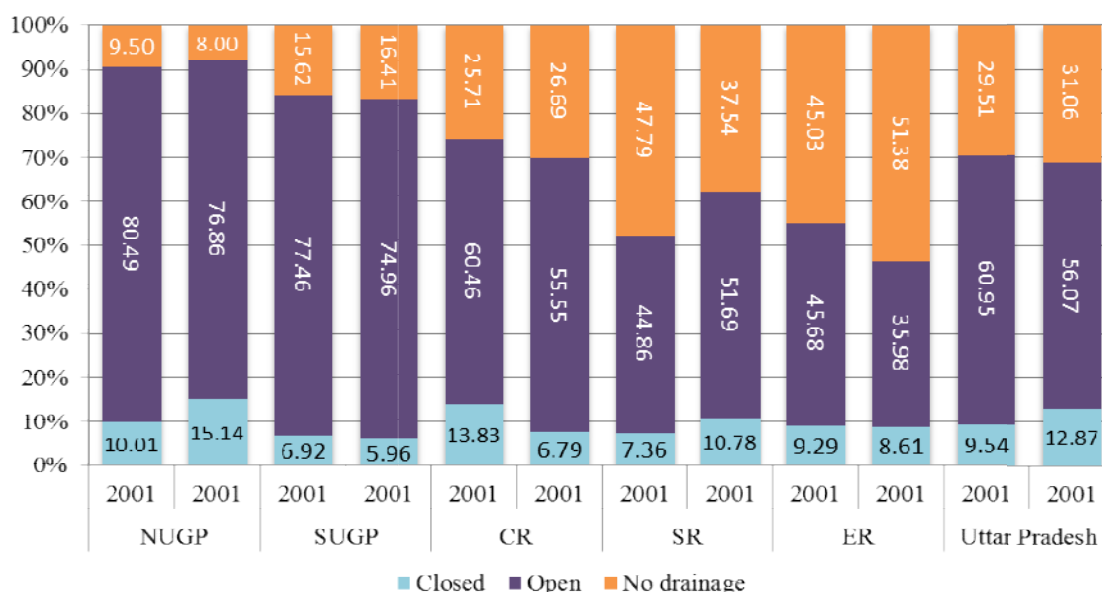
## 8.3 Sewerage and Drainage Facilities

As shown 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, Rudrapur, 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.

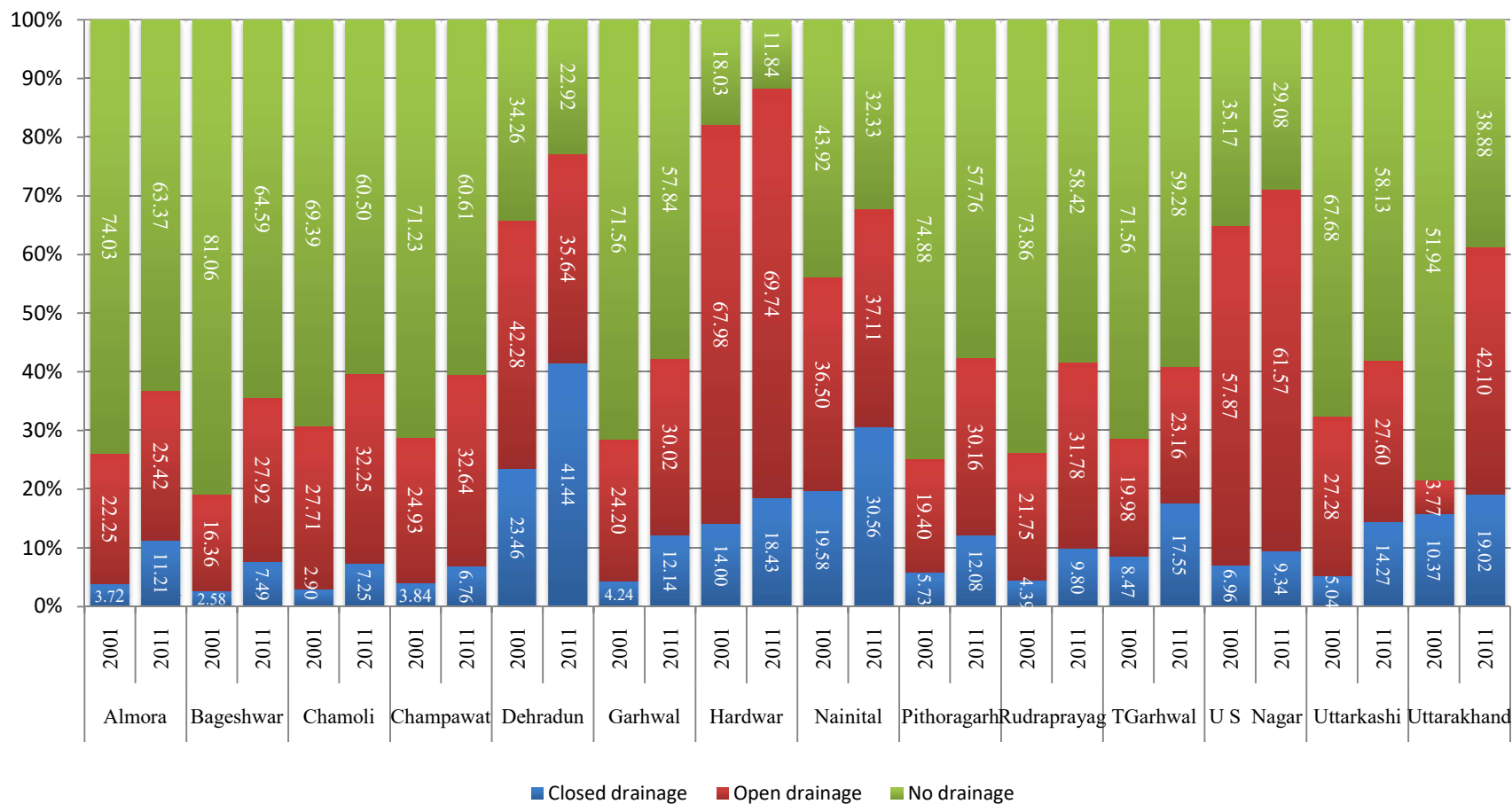
Figure 28 shows regional distribution of households by types of drainage facilities in Uttar Pradesh. On this count the situation appears to be worse in lower part of Uttar Pradesh i.e., ER and SR where according to the Census 2011 more than 50% and 35% households respectively did not possess any drainage 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 Kishanganj 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 28: Region-wise Distribution of Households by Types of Drainage in Uttar Pradesh**



**Figure 27: Distribution of Households by Main Types of Drainage in Uttarakhand**

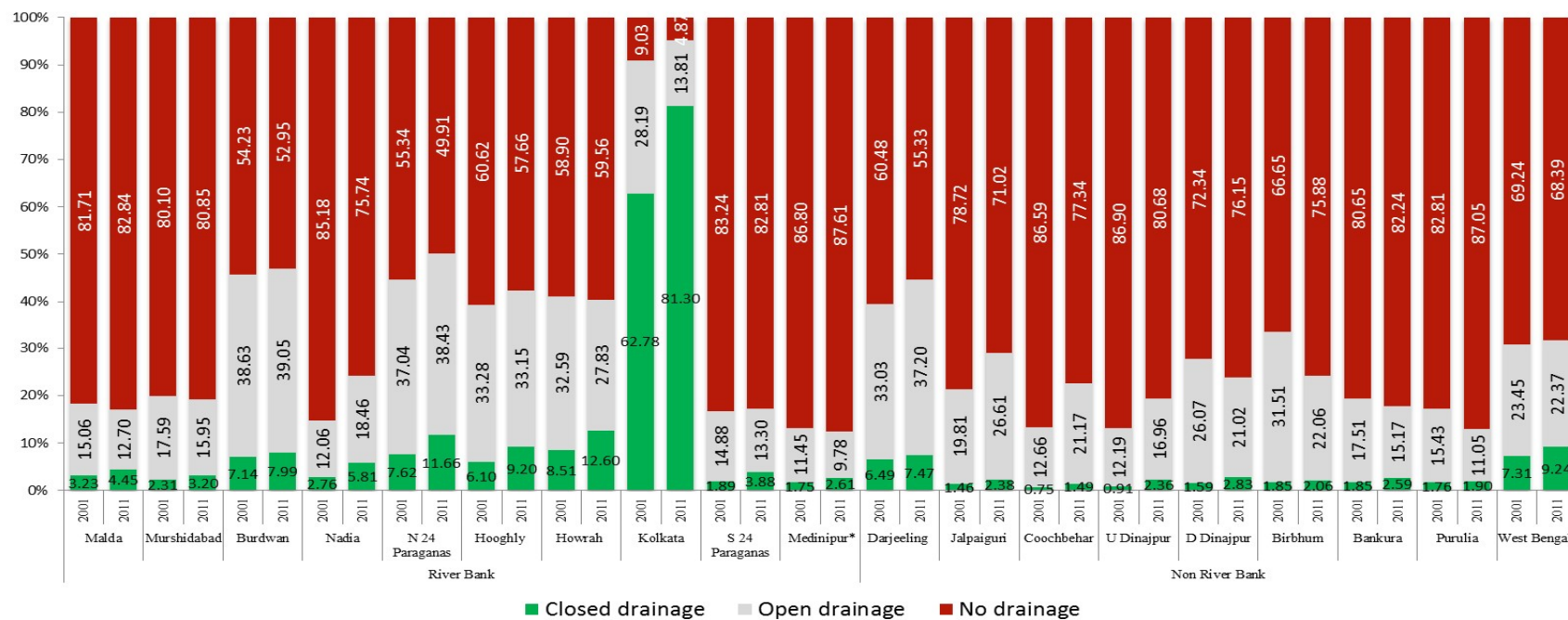


Figure 29: Distribution of Households by Main Types of Drainage in West Bengal

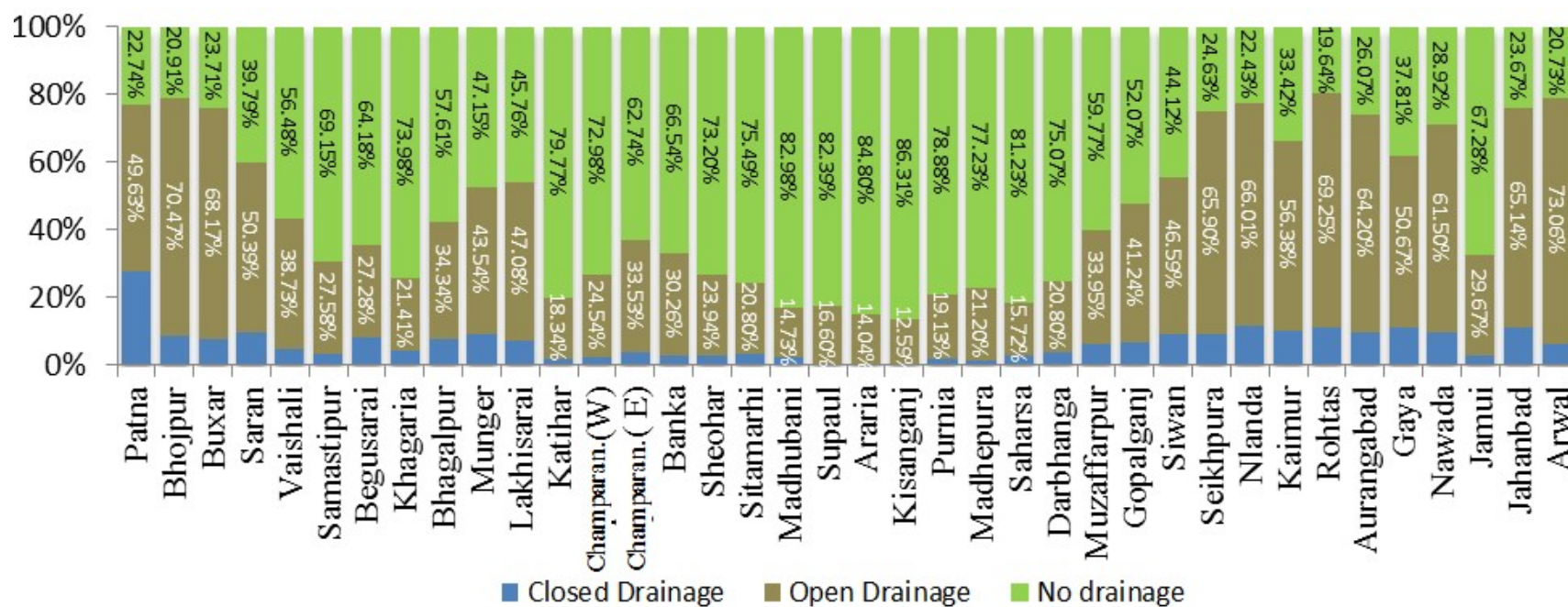
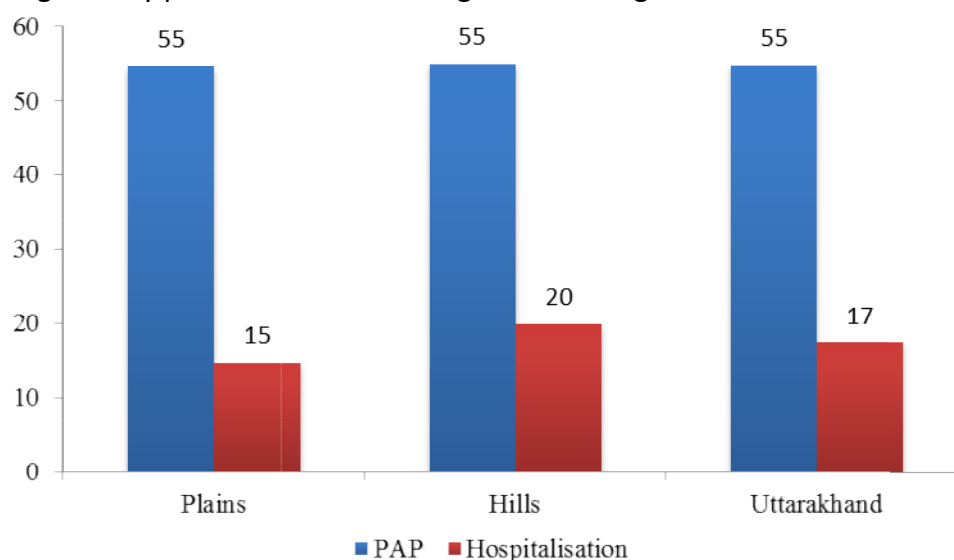


Figure 30: Distribution of Households by Main Types of Drainage in Bihar (2011)

## 8.4 Morbidity

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

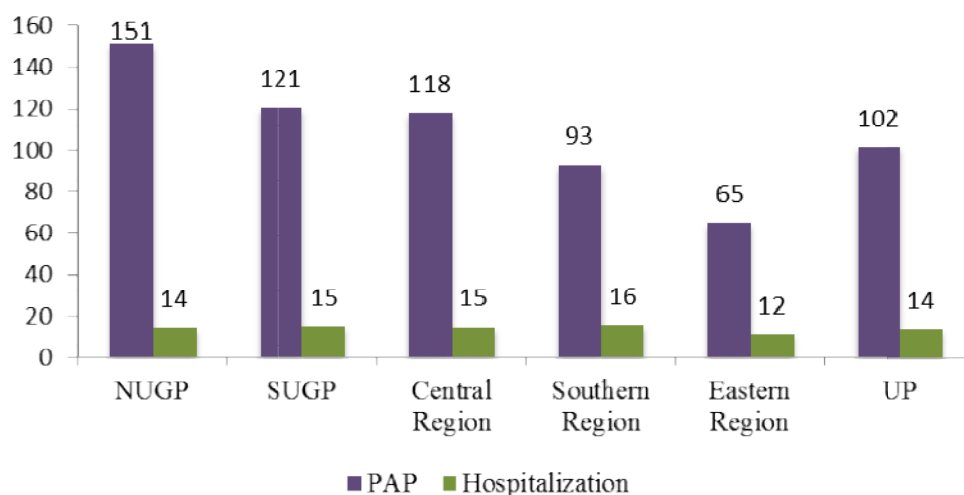
Figure 31 presents estimates on prevalence of morbidity in terms of Proportion of Ailing Persons (PAP) and Number of Persons Hospitalised (per 1000) in Uttarakhand. The PAPs estimate for overall Uttarakhand (including plains and hills) stands at 55 per 1000 persons. However, the number of persons hospitalized (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 60<sup>th</sup> 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**

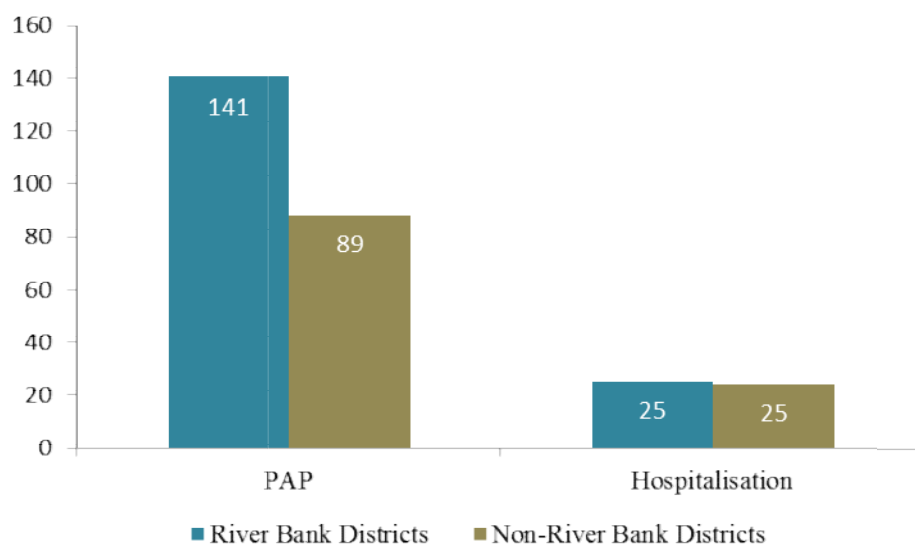
Figure 32 presents PAP and hospitalisation pattern across regions in UP in 2004. NUGP with PAP of 151 per 1000 was found to be highest while eastern region reported lowest at 65 per 1000. In NUGP 85% of the households had either open drainage or no drainage facility, 42% households were devoid of latrine 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 60<sup>th</sup> 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 reporting 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.

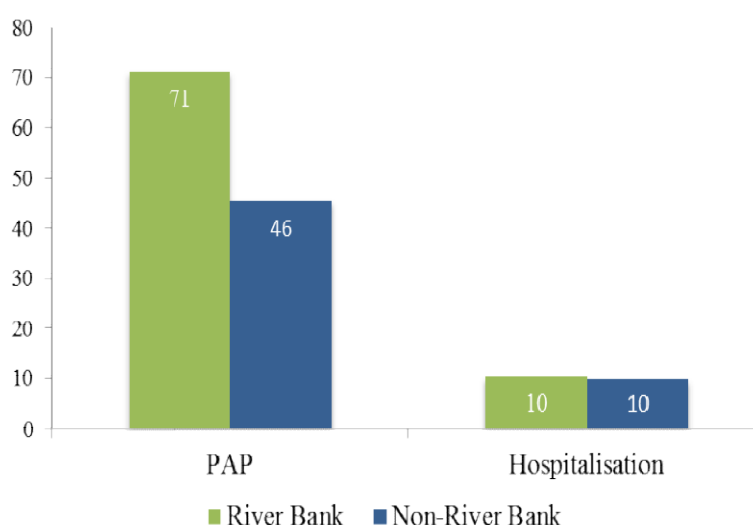


Source: NSS 60<sup>th</sup> round Unit level data, 'Morbidity, Health Care and the Condition of the Aged, Jan.-June, 2004'

**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 lifestyle and fresher air could also be contributing to lower level of ailments in Uttarakhand and parts of Bihar.



Source: NSS 60<sup>th</sup> 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 aggregate 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 constitutes 5.75% of total expenditure on bottled water in India.
11. Notwithstanding increase in access to sanitation during 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<sup>th</sup> Plan to Rs.20,098.4 crores during the 11<sup>th</sup> 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 morbidity 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 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 GRBEMP:

1. For properly functioning water supply and sanitation services, capacity of local self-government institutions be improved. Under 73<sup>rd</sup> and 74<sup>th</sup> 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 outcome because quality of construction is very poor. There is a strong need to create capacity at the lowest level for proper implementation, supervision and monitoring.
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 exposure                       | Subcategories                                                                                                                     | Example(s)                                                                                                                              |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| <b>Water-borne micro-biological disease</b> | Diseases related to consumption of pathogens consumed in water; most due to human or animal faecal contamination of water            | Drinking water                               | (i) Treated or untreated (raw) water (ii) Public (municipal) supplies or private supplies                                         | Cholera, Typhoid fever, viral gastroenteritis e.g. due to Norovirus                                                                     |
| <b>Waterborne chemical disease</b>          | Disease related to ingestion of toxic substances in water                                                                            | Drinking water                               | (i) Treated or untreated (raw) water (ii) Public (municipal) supplies or private supplies                                         | Arsenicosis                                                                                                                             |
| <b>Water hygiene diseases</b>               | Diseases whose incidence, prevalence or severity can be reduced by using safe (clean) water to improve personal and domestic hygiene | Any water used for washing/ personal hygiene | (i) Disease related to variations in water quality (ii) Disease related to water Shortage                                         | Scabies, shigellosis; trachoma                                                                                                          |
| <b>Water contact diseases</b>               | Caused by skin contact with pathogen- infested water or with chemical-contaminated water                                             | Recreational water                           | (i) fresh water sources (ii) marine waters                                                                                        | Schistosomiasis (bilharzia); cyanobacteria                                                                                              |
| <b>Water vector habitat diseases</b>        | 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); filariasis (mosquitoes); onchocerciasis (aquatic flies); schistosomiasis (snails); trypanosomiasis (tsetse flies) |
| <b>Excreta disposal diseases</b>            | 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 direct/ indirect contact with faeces/ urine | Ascariasis; faecal-oral infections e.g. shigellosis; schistosomiasis ; trachoma                                                         |
| <b>Water aerosol diseases</b>               | 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: Distribution of Persons Hospitalised (Per 1000 Population) 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  |
| <i>Gastro-intestinal</i>                              |     |    |      |     |       |     |      |    |       |    |        |    |       |    |
| 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  |
| Amoebiasis                                            | 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 |
| <i>Cardiovascular Diseases</i>                        |     |    |      |     |       |     |      |    |       |    |        |    |       |    |
| 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 |
| <i>Respiratory including ear/nose/throat ailments</i> | 27  | 25 | 45   | 14  | 11    | 15  | 37   | 30 | 28    | 27 | 37     | 30 | 35    | 30 |
| <i>Tuberculosis</i>                                   | 35  | 25 | 27   | 0   | 50    | 25  | 24   | 19 | 33    | 22 | 30     | 17 | 30    | 17 |
| <i>Bronchial asthma</i>                               | 27  | 24 | 7    | 0   | 20    | 4   | 15   | 37 | 21    | 28 | 38     | 31 | 34    | 30 |
| <i>Disorders of joints and bones</i>                  | 14  | 37 | 106  | 34  | 29    | 39  | 5    | 13 | 16    | 26 | 27     | 26 | 25    | 26 |
| <i>Diseases of kidney/urinary system</i>              | 37  | 38 | 59   | 84  | 36    | 31  | 39   | 53 | 38    | 46 | 37     | 50 | 37    | 49 |
| <i>Prostatic disorders</i>                            | 5   | 4  | 0    | 0   | 12    | 28  | 14   | 12 | 10    | 9  | 2      | 3  | 4     | 4  |
| <i>Gynecological disorders</i>                        | 66  | 45 | 30   | 17  | 72    | 87  | 38   | 43 | 56    | 46 | 51     | 52 | 52    | 50 |
| <i>Neurological disorders</i>                         | 23  | 23 | 4    | 0   | 50    | 35  | 22   | 17 | 27    | 20 | 33     | 35 | 32    | 32 |
| <i>Psychiatric disorders</i>                          | 15  | 11 | 2    | 0   | 10    | 2   | 5    | 10 | 10    | 10 | 10     | 5  | 10    | 6  |
| <i>Eye ailments</i>                                   |     |    |      |     |       |     |      |    |       |    |        |    |       |    |
| 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           |
| Sexually transmitted diseases                      | 3           | 0           | 0           | 0           | 3           | 2           | 0           | 0           | 2           | 0           | 2           | 1           | 2           | 1           |
| <i>Febrile illnesses</i>                           |             |             |             |             |             |             |             |             |             |             |             |             |             |             |
| 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           |
| <i>Disabilities</i>                                |             |             |             |             |             |             |             |             |             |             |             |             |             |             |
| Locomotor                                          | 19          | 6           | 19          | 0           | 20          | 6           | 6           | 11          | 14          | 8           | 13          | 9           | 13          | 9           |
| Visual including blindness<br>(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<br>/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          |
| <i>Others</i>                                      |             |             |             |             |             |             |             |             |             |             |             |             |             |             |
| 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          |
| <b>TOTAL</b>                                       | <b>1000</b> | <b>1000</b> | <b>1000</b> | <b>1000</b> | <b>1000</b> | <b>1000</b> | <b>1000</b> | <b>1000</b> | <b>1000</b> | <b>1000</b> | <b>1000</b> | <b>1000</b> | <b>1000</b> | <b>1000</b> |

Source: Unit level records of NSS 60<sup>th</sup> 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 |
| Champanan(E) | 15.54       | 69.63 | 5082.87 | Supaul          | 12.52       | 71.88  | 1114.20 |
| Gaya         | 9.95        | 61.68 | 2189.69 | Champanan (W)   | 10.66       | 74.01  | 1961.39 |

*Source: RHS Bulletin, Ministry of Health & Family Welfare*

**Table A5.1: 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                                | <b>11</b>  | <b>14</b> | <b>17812</b>                     |
| <i>Source: National Health Profile, 2011</i> |            |           |                                  |

**Table A5.2: 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                             |
| <i>Source: National Health Profile, 2011</i> |            |         |                                  |

**Table A5.3: 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              | <b>7</b>   | <b>3</b> | <b>6160</b>                      |

*Source: National Health Profile, 2011*

**Table A5.4: 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        | <b>12</b>  | <b>2</b> | <b>5883</b>                      |

*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/<br>resin/reverse<br>osmosis | Filter  | Boiling | Others | No. per 1000<br>Treating<br>water<br>Before<br>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 60<sup>th</sup> 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/<br>resin/reverse<br>osmosis | Boiling | Filter | Cloth<br>screen | Others | No. per 1000<br>Treating<br>water<br>Before<br>drinking |
|-----------------|---------|-------------------------------------------|---------|--------|-----------------|--------|---------------------------------------------------------|
| Champan(W)      | Rural   | (--)                                      | (--)    | (--)   | (--)            | (--)   | (--)                                                    |
|                 | Urban   | 0%                                        | 0%      | 100%   | 0%              | 0%     | 22                                                      |
| Champan(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 60<sup>th</sup> 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, WB (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                                          |
| Bardhaman         | 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 60<sup>th</sup> 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        |
|---------------------------|-------------------|---------------------|--------------------|---------------|-------------------|
| <b>Bank Districts</b>     | 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%            |
| <b>Non-Bank districts</b> | <b>Districts</b>  | <b>Water Closet</b> | <b>Pit Latrine</b> | <b>others</b> | <b>No latrine</b> |
|                           | 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. Kisanagan     | 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%            |