



## SANITATION, HEALTH AND HYGIENE SCENARIO IN ANDHRA PRADESH STATE OF INDIA

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The study attempts to analyze the impact of the Total Sanitation Campaign (TSC) on Rural Households in Andhra Pradesh in terms quality of life. To question why and how much it costs to build a toilet would be churlish. Open defecation and open urination are national shames – not just from the aesthetic, human dignity and cleanliness angles, but from the health angle also. The study is carried out by examining various issues relating to sanitation and hygiene such as open defecation, availability of toilet facility, restricted use of a toilet, availability of water and drainage facilities, disposal of solid waste etc.

**Keywords:** Total Sanitation Campaign, Sanitation, Health, Hygiene, Open defecation.

### Introduction

Sanitation is a critical issue as it is linked to both human health and basic dignity of life, especially for women and young girls. Poor sanitation directly results in a not only decline in the quality of life but also the quantity of available water resources and the problem is now fully being treated with a greater degree of seriousness than ever before. This was highlighted during World Summit on Sustainable Development in Johannesburg in 2002, where the existing Millennium Development Goals (MDGs adopted by the U. N. in New York in September 2000) were expanded to include the sanitation target of halving the proportion of people without access to sanitation in 1990 by the year 2015. Low access to sanitation, whilst having disastrous effects on public health is also causing a very adverse impact on the environment.

The problem of poor sanitation is expected to become more serious in the years to come as the city population continues to grow rapidly. It is projected that by the year 2030, the urban population will grow to 3.3 billion, over 90 percent of which will accrue to the cities of developing countries (UNCHR 1997). In the past ten years, diarrhea has killed more children than all those killed in wars and armed conflicts in almost sixty years, since the end of Second World War. A child dies every 15 seconds from diarrhea caused largely by poor sanitation and unsafe water provisions (WSSCC 2000). Despite the efforts and investment, many low-income countries continue to suffer from inadequate and unsafe sanitation.

The Millennium Development Goals (MDGs) advanced by the international community states that the aim is to halve the number of people without adequate sanitation facilities by 2015. To achieve this target, on an average 3.5 lakh people per day will have to gain access to improved sanitation between now and 2015 (IRC 2003). Despite the global commitments, the improvements made by many countries during the last one decade are very poor and the identified constraints include financial difficulties,

institutional problems, inadequate human resources, and absence of political commitment, insufficient community involvement, inadequate operation and maintenance, lack of hygiene education, poor water quality, people's attitude towards sanitation and insufficient information and communication (WHO/UNICEF 2000).

Government of India has introduced the Total Sanitation Campaign (TSC) alongside the long-running Central Rural Sanitation Programme (CRSP). The TSC has been designed to be more demand-responsive, using IEC (Information, Education & Communication) to stimulate demand, while also promoting low-cost sanitation technologies and alternative delivery mechanisms. The supply driven CRSP was completely stopped by March 2002, leaving the TSC as the main government program for rural sanitation.

The most striking thing about Total Sanitation Campaign is the amount of financial resources allocated by authorities for its implementation. The total planned outlay of the TSC is US \$ 810 million, including as high as the US \$ 4 million per district in the more populous states. However, the TSC is not entirely financed by the government, as 19 percent of the planned expenditure will be from self-provision (their own contribution) by the rural households that built toilets as a result of TSC.

Over 626 million Indians do not have access to toilets and rapidly modernizing India is drowning, literally, in its own urine and excreta. Total sanitation campaign has been launched by the government of India to eliminate open defecation within a decade. It is in this ocean of excreta and urine that our rural and urban slum children are growing up.

The health consequence of this scenario is scary and mind boggling. Dr. John Humphrey of Johns Hopkins University pointed out that, of the 555 million pre-school children in developing countries 32 percent are have stunted growth and 20 percent are underweight. These two conditions cause a death of one in every five children before they reach their fifth birthday.

From a different perspective, this vast investment reflects the huge rural population in India without any access to sanitation. But the TSC budget is almost 20 times larger than the equivalent national program in Bangladesh, whereas the unserved population in India (755 million) remains only 10 times higher than that in Bangladesh (71 million) or Pakistan (55 million). The impressive size of the TSC budget also reflects both facets of India's buoyant and booming economy with the considerable rise in tax collections every year after launching economic reforms in 1991, apart from the emphasis on large scale government interventions in social sector progress.

## Methodology

### 1 Objectives of the Study

The following are the specific objectives of the study.

- To analyze the Health, Hygiene and Sanitation situation.
- To examine the levels of open defecation and its determinants, considering the sample households.
- To find out the determinants of health expenditure, considering primary data relating to sample households.

### 2 Hypotheses

Based on the objectives to be achieved, the following hypotheses were formulated:

1. Socio-economic conditions have its own impact on health, sanitation and hygiene conditions.
2. Open defecation is more behavior related rather income and education considerations.
3. Health expenditure is independent of income but depends more on sanitation and hygiene conditions.

### 3 Data Sources

The study is based on both primary as well as secondary sources of data. It is proposed to organize the study through designing a well-structured schedule covering socio-economic aspects such as details about social classification, literacy levels, the size of family, type of family, number of living rooms. Further, the questionnaire is also designed to include information relating to health, hygiene and sanitation aspects. In order to pursue the objectives outlined, the study is designed to examine the economic aspects of health, hygiene, and sanitation in Andhra Pradesh. Data is collected for the cross-section period 2009-10. Further, secondary data relating to health, hygiene and sanitation are drawn from NSSO 38<sup>th</sup> Round, 1998 (National Sample Survey Organization) and other sources such as Government Reports, Statistical Abstracts of Andhra Pradesh and India published by the Directorate of Economics and Statistics. Hand Book of Statistics, Vijayanagaram District published by the Chief Planning Office, Vijayanagaram, Economic Survey of India and Andhra Pradesh, Journals, periodicals constitute the secondary data sources. Information is also obtained by accessing the reports of the Department of Drinking Water and Sanitation, Ministry of Rural Development, Government of India, New Delhi and tapping various sites on the web.

### 4 Sample Design

In order to pursue the objectives outlined, it is proposed to consider a simple random sample of 255 households from one village namely Vasadi in Gantiyada Mandal of Vizianagaram district in Andhra Pradesh. The village is noticed to be suffering on account of serious sanitation problems and related diseases with people practicing widespread open defecation without arrangements for lifting garbage. Hence, the village is selected for study, after carefully examining several villages in the district. Further, 15 percent of the households in the village accounting for 255 is considered. A well-structured questionnaire is prepared after making a pilot study with the appropriate focus on group discussions and other rural participatory appraisal techniques.

### 5 Techniques Employed

In order to pursue the objectives outlined, the following methodology is used to analyse different aspects. In the present study Ordinary Least Square method (O.L.S) is used to estimate the growth equations as well regression equations. Under certain assumptions such as homoscedastic disturbances, an absence of autocorrelation and multicollinearity, the O.L.S method yields Best Linear Unbiased Estimates (BLUE). To the best possible extent care has been taken to avoid the problems associated with the said assumptions. Stepwise regression was used to avoid the problem of multicollinearity. Further, simple tools such as averages and percentages are used to analyze various aspects. Moreover, chi-square test of independence of attributes is employed to observe the relationship between various aspects relating health, hygiene, and sanitation. In this section, an attempt is made to briefly explain about the OLS method of estimation, regression technique and Chi-square test of independence.

### Review of Literature

C. Rangarajan and S. Mahendra Dev have pointed out that a higher well-being of average Indian can be attained only through increased public expenditure on sanitation, drinking water, health, education and other essential social services. Dipali Rastogi highlights the differences in use of water and toilet habits between western nations and Indians and the need for efficient use of limited water resources available in toilets in India. Shasank Bhide observed that the strategies adopted by NGOs are more effective than that have been used by government in promoting sanitation. Hunton. Rodriguez has examined the issues like

health, water, environmental, tourism and other welfare aspects associated with poor sanitation in Cambodia, Indonesia, Philippines and Vietnam. Pruss – Ustun analyzed the country data of disease burden attributable to unsafe water, inadequate sanitation, insufficient hygiene and inefficient management of water resources. The World Bank Field note highlights the urgent need of providing clean sanitation and drinking water for HIV – AIDS patients as their immunity levels being very low and they are prone to catching infections very quickly. UNDP report reveals that, India loses most number of lives to diarrhea in the world, yet it's military spending is more than ten times that of sanitation. Dilip Mavalankar pointed out that the most vital sector of infrastructure for achieving the goal of health for all is provision of sanitation and drinking water. Jai Ram Ramesh wrote that India has far more cell phones than toilets and more money spent on electronic goods than investing in a clean toilet.

### Major Findings of the Study

It is observed that an average 82.5 percent of Indian population living in rural areas did not have a toilet at home to defecate in private and were resorting to open defecation. State –wise analysis shows that Orissa had the highest percentage of people without access to toilet i.e., 96.1 percent followed by Madhya Pradesh (94.6 percent), Uttar Pradesh (90.6 percent), Bihar (89.4 percent), Karnataka (88.9 percent), Andhra Pradesh and Tamil Nadu (88.5 percent), Rajasthan (87.0 percent), Maharashtra (85.8 percent), Haryana (84.5 percent), Gujarat (79.9 percent), West Bengal (76.1 percent), Punjab (67.9 percent) in that order. It is interesting to observe that Assam with 24.7 percent, Kerala with 23.1 percent and the North-Eastern States with 18.1 percent account for the lowest percentage of rural households without any latrine facility. Thus, our analysis shows that there are 10 major states which are found to be before the national average with Andhra Pradesh being the 6<sup>th</sup> in state in terms of rural households without latrine facilities. It may also be observed that smaller states are better placed compared to the larger states in this regard.

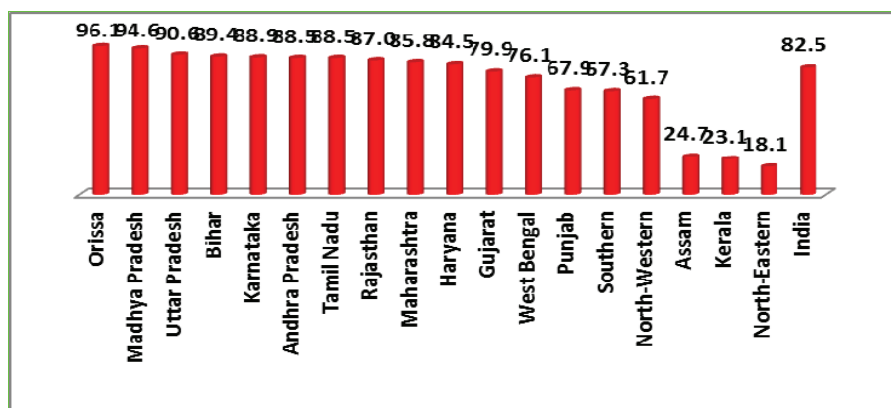


Figure 1. State-wise no latrine used: Rural (per 1000)

It may be observed that the urban households without access to toilets are estimated as 25.5 percent at the all India level. However, state-wise analysis reveals that smaller states such as Assam with 2.0 percent, North Eastern States (2.4 percent) and Kerala (5.1 percent) are better placed as compared to major states like Bihar (45.3 percent), Madhya Pradesh (45.2 percent), Orissa (35.9 percent), Tamil Nadu (32.5 percent), Andhra Pradesh (30.8 percent), Karnataka (30.0 percent) are at the bottom of the ladder in terms of urban households without access to toilets. Thus, this reveals that in terms of urban households having access to the latrine facilities smaller states compared to larger states in India. There are 9 major

states that have reported more than the national average in terms of no access to a latrine. Interestingly Andhra Pradesh reveals 6<sup>th</sup> in the country with states without access to the latrine in the urban areas also.

It shows the distribution of service latrines or public toilets built by government agencies like village Panchayats in rural areas. From the table, it may be observed that nearly 3 percent of the rural households in India are provided with service latrines (public toilets) by local bodies. In this regard, also Assam and North-Eastern states have performed very well by providing access to more than 19 percent and 11 percent of the rural population respectively. In the remaining states due to the neglect of this provision more open defecation is observed. In the case of Andhra Pradesh, mere one percent rural household is provided with service latrines. However, states like Bihar (1.6 percent), Madhya Pradesh (1.1 percent), Haryana (1 percent), Orissa (0.9 percent) and Karnataka (0.3 percent) have neglected the public facility of providing service latrines.

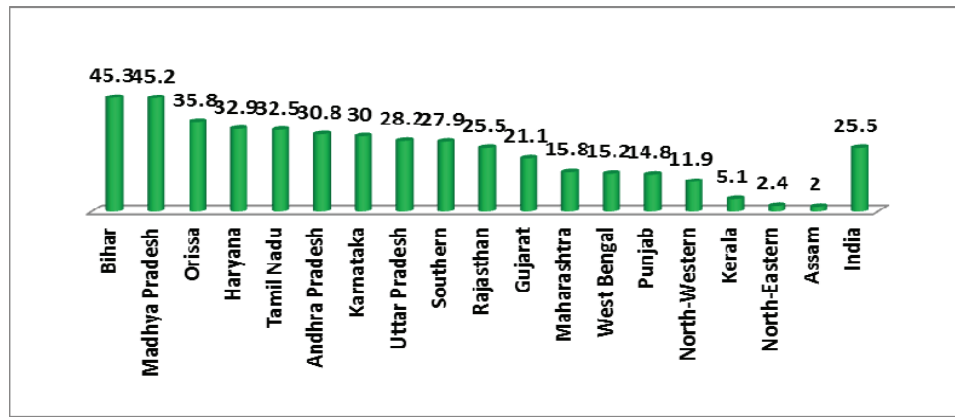


Figure 2. State-wise no latrine used: Urban (per 1000)

### 1 The State-wise distribution of urban households by use of service latrine in India

The state-wise data shows that Assam and Uttar Pradesh have performed very well by providing access to 20 percent and nearly 18 percent of their urban households. Whereas Andhra Pradesh has provided this essential facility to only 1.2 percent of urban households which is lowest in the country. There are five major states such as Assam (20.1 percent), Uttar Pradesh (17.7 percent), Haryana (9.7 percent), Orissa (7.7 percent) and Madhya Pradesh (6.2 percent) which are above national average in this regard. There are 10 states which are below national average- Bihar, and Rajasthan with 5.2 percent each, followed by West Bengal (5.1 percent), Kerala (3.6 percent), Tamil Nadu (3.0 percent), Gujarat and Karnataka (1.8 percent) each. One can infer from this table that resourceful states like Punjab, Maharashtra, Gujarat, Andhra Pradesh and Tamil Nadu have done badly compared to lower income states like Assam, U.P. Orissa, and M.P. as far as providing this basic facility. Thus, the access to service latrine in urban areas is also very limited in most of the states in India with Andhra Pradesh at the bottom of the ladder.

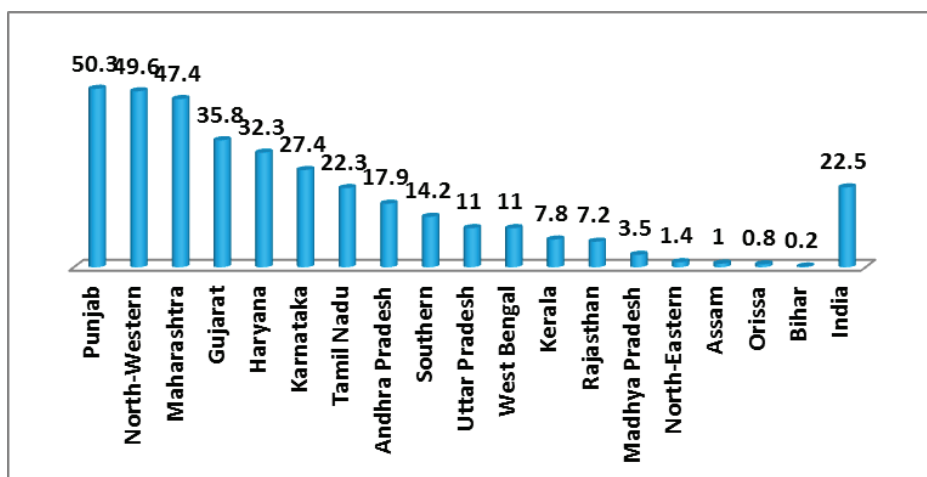


Figure 3. State-wise use of Service Latrine: Urban (per 1000)

### 2 The State-Wise Distribution of Rural Households by Use of Septic Tank Toilet

It shows that on an average 7.5 percent Indian rural households use septic tank toilets. The state-wise analysis shows that Kerala has highest percent i.e., 26.0, followed by Punjab (16.8 percent), Gujarat (15.3 percent) and Maharashtra (11.6 percent) in that order. It is interesting to note that Orissa (1.7 percent), Karnataka (2.6 percent), Rajasthan (3.3 percent), M.P (3.4 percent), U.P and Bihar with 4.5 percent each are accounting for the lowest percentage of rural households using septic tank toilets. Our analysis shows that there are 9 states which are above national average and 7 states are below the national average i.e. 7.5 percent of rural households using septic tank toilets. In Andhra Pradesh, 9.3 percent of rural households use this technology and it ranks 7<sup>th</sup> in the country. In southern states, 23 percent rural households use septic tank technology which is very popular with masons and households, unlike northern states where twin-pit pour flush technique is widely used.

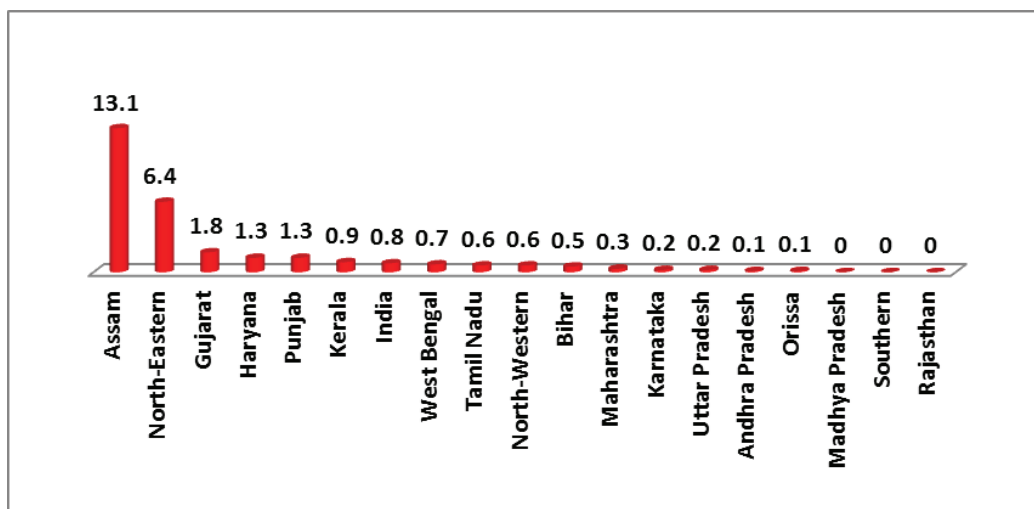


Figure 4. State-wise use of Septic Tank: Rural (per 1000)

### 3 Use of Septic tank toilet in Urban Areas

It may be observed that more than 35 percent of the urban population use septic tanks toilet in India. Out of the 9 major states accounting more than the national average in terms of use of the septic toilet in urban areas, Andhra Pradesh with 43 percent ranks 8<sup>th</sup> in the country. The highest percentage of urban households using this method are in Assam (61.1 percent) followed by West Bengal with 55.8 percent, Orissa with 50.5 percent, Kerala with 48.8 percent and Bihar with 45.2 percent etc., On the other hand, out of the 9 states accounting for lowest percentage of urban households using this technique, Haryana (7.5 percent) ranks first, followed by Karnataka (22 percent), Punjab (23.4 percent) and Maharashtra (30.3 percent) etc.. The reason for this may be due to the use of twin-pit pour flush toilet is in most of the Northern states of India.

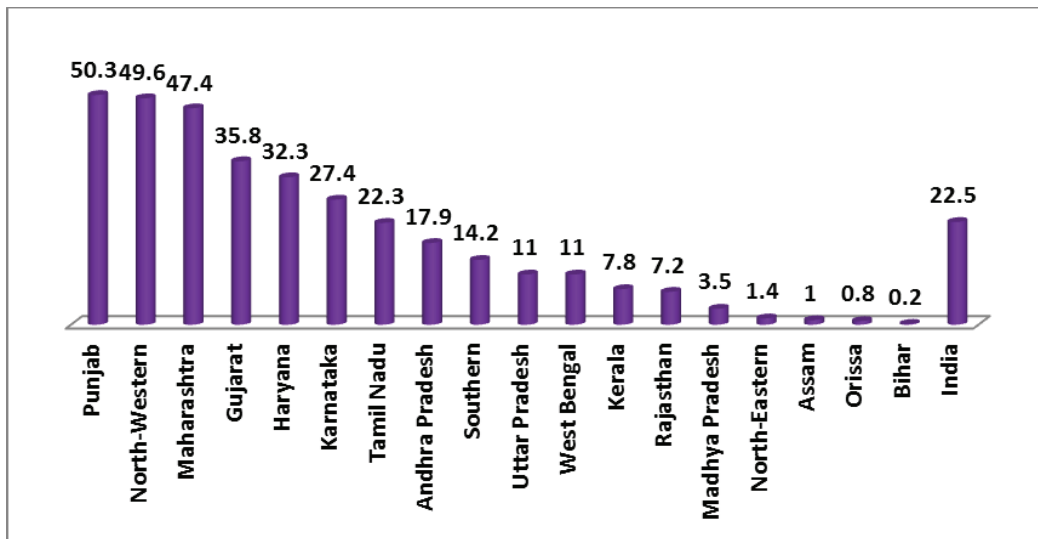


Figure 5. State-wise use of Septic Tank: Urban (per 1000)

### 4 Use of Pour-flush Pit Toilet in Rural Areas

It may be observed from the above table that the overall percentage of rural households using this technique is about 3 percent in India, whereas in Andhra Pradesh less than 1 percent rural households use this method as they rely more on septic tank technology. The highest percentage of households using pour-flush technique is reported in Kerala i.e., 29.3 and the lowest is reported in Maharashtra i.e., 0.3 percent. The states which are above the national average of 2.9 percent in adopting this technique are Kerala (29.3), Karnataka (7.7 percent), Assam (6.5 percent), Haryana (5.1 percent), Punjab (4.2 percent), north-eastern States (4.6 percent), north-western States (4.2 percent). The states which are below national average are West Bengal (2.6 percent), Gujarat (2.5 percent), Rajasthan (2.3 percent), Bihar (1.3 percent), U.P. (1.2 percent), Tamil Nadu (0.9 percent), Andhra Pradesh (0.6 percent), Orissa (0.5 percent) and Maharashtra (0.3 percent). Thus, in the case of use of Pour-flush pit toilet in rural areas Andhra Pradesh is found almost at the bottom only ahead of Orissa and Maharashtra.

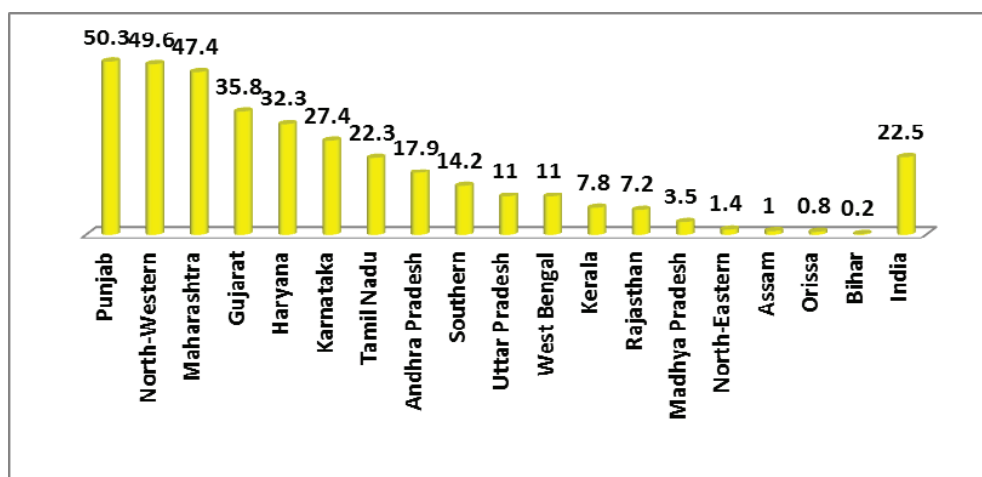


Figure 6. State-wise use of Pour Flushes Pit: Urban (per 1000)

### 5 Use of Pour-flush Pit-Toilet in Urban Areas

The state wise distribution of urban households by Pour-flush pit in India per 1000 people is presented in Table 5.8. One can observe from the table 5.8 that 8.4 percent urban households in the country have used pour-flush pit technique. It is very popular among Kerala urban households as 26 percent (highest in the country) adopted ‘pour - flush pit’ method while in Orissa reported 3.4 percent adoption which is lowest in the country. While in Andhra Pradesh around 5 percent urban households are using this technique. The data clearly shows this technique of twin pit pour flush is popular in urban areas of north-western states with 10.1 percent households adopting it. The states with a higher average of adoption of this technique in urban areas above the national average (8.4 percent) are Kerala (25.5 percent), Rajasthan (19.3 percent), Karnataka (18.1 percent), Haryana (16.5 percent), U.P. (10.7 percent). The states below the national average are Gujarat and West Bengal (7.2 percent each), Punjab and Tamil Nadu (6.5 percent), M.P. (4.9 percent), Andhra Pradesh and Maharashtra (4.6 percent), Bihar (3.6 percent), Orissa (3.4 percent), Assam (3.3 percent).

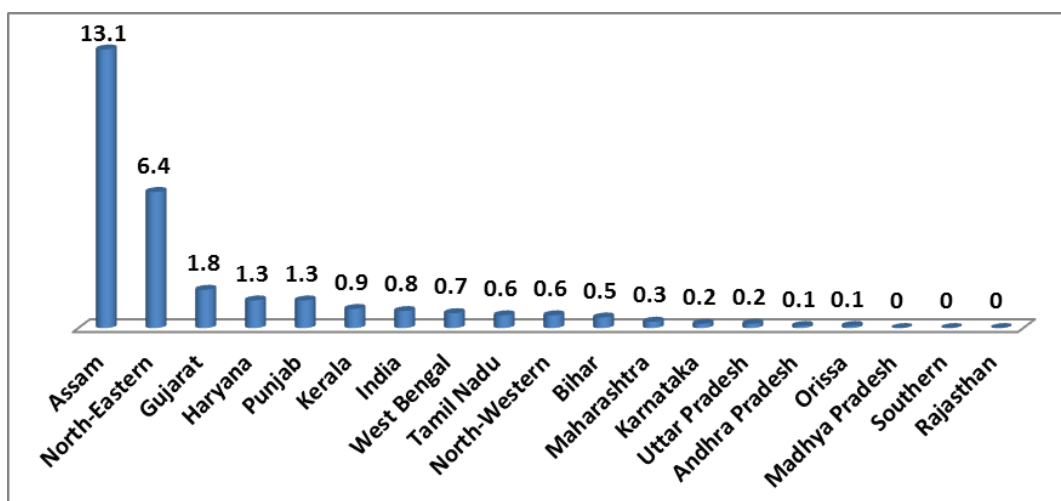


Figure 7. State-wise use of Sewerage System: rural (per 1000)



## 6 Sanitation and Status of Public Health in Andhra Pradesh

It is observed that there is a massive shortage of trained health personnel due to the absence of interest on the part of the government. There is a deficit of more than 350 PHCs and more than 300 community health centers. It also indicates the huge gap in the number of required male and female health assistants, ANMs, LHVs in the state which is between 1500 to 6400. There is need to recruit urgently more than 70 Obstetricians and Gynecologists, 150 Physicians, around 80 Pediatricians and around 400 total specialists in the state. Similarly, to strengthen the health infrastructure the state requires employing more than 100 radiographers, 120 pharmacists, 370 laboratory technicians and nurses/midwife respectively.

It may be observed that the data does not give a very favorable picture of Andhra's performance in the health sector by looking at the achievements and the goals set out by NRHM/RCH III (2012) though they are satisfactory compared to national averages in achievement. While the goal was less than 100 as maternal mortality ratio Andhra has recorded 154 in 2004-06 compared to national average of 254(2004-06). In the case of infant mortality, our state recorded 54 which is down from 59 (2003 SRS) but almost level with the national average of 55. Another vital indicator is total fertility rate where the state is close to the goal of 2.1 while it's achievement is 1.9 and it is certainly better than the national average of 2.7(SRS 2007).

Close to 90 percent expecting mothers received antenatal care /checkups compared to national average of 51 percent. While only 19 percent of expecting mothers received full antenatal check-up in the country, in Andhra close to 38 percent received that facility. Similarly, in institutional deliveries also the state has recorded 72 percent while the national average is only 47 percent in 2007-08. More than 67 percent children (12-33 months age) have been fully immunized in the state compared to 54 percent in the country. The percentage of children (6-35 months age) breastfed for at least 6 months has been recorded to be 32 percent while the national average is close to 25 percent in 2007-08 though it fell by 10 percent in the state from 2002-2004 but rose by 2 percent at the national level in the same period.

Percentage of children with diarrhea receiving ORS in the last two weeks is 43 percent while the national average is close to 34 percent. Similarly, the use of the modern contraceptive method in the state is 65 percent while the national average is 47 percent. In the case of family planning methods like spacing and terminal methods, Andhra's performance has been exemplary as shown by the percent of unmet need of these methods to be just 8.5 percent while the national average is 21.5 percent.

## 7 Sanitation Levels in Vasadi Village of Andhra Pradesh: Empirical Evidence:

It may be observed that a majority of the sample households i.e. 37.25 percent live in homes with RCC roof followed by 33.33 percent in tiled houses, 27.45 percent in thatched houses while just 2 percent lives in dwellings made of mud. This shows that around 70 percent of the sample households are having pucca houses (either tiled or RCC roofed) in the sample village.

It may be observed that a majority of sample households i.e. around 70 percent are getting drinking water from shared community bore well, on the other hand about 14 percent are getting drinking water from hand pumps and about 12 percent from public tap or stand post set up by village panchayats, 2.0 percent get from own wells and just 0.4 percent get from own tap installed at home. From this, it may be inferred that community bore well is the main source of drinking water for the sample households in Vasadi village. It may be observed that two-thirds of the sample households i.e. 66.27 percent do not have access to drainage system while one-third i.e. 33.73 percent have access to the drainage system.

It suggested that a majority i.e. nearly 69 percent have reported that local panchayats are not providing drainage in the village. It is interesting to note that about 17 percent could not build drains to take dirty water out of home due to lack of finance/poverty and around 15 percent felt they are not at all important for them. Thus, it clearly shows that lack of civic amenities, poverty and ignorance are the main reasons for not having drainage in the village. It is clear that as many as 57 percent reported irregular clearing of drainage in the village, while 17.51 percent reported drainage clearing twice a week.

### **8 Mosquitoes Menace**

It may be observed that out of the total sample households as many as 45 percent reported mosquitoes menace due to water logging, 27.45 percent attributed to unclear drains, 13.73 percent each attributed to garbage heaps on roads and absence of drains in their locality. From the above, it is clear that the mosquitoes menace is largely due to lack of hygiene and sanitation in the sample village. It may be inferred that panchayat authorities should intervene to reduce mosquitoes menace by providing clean hygienic conditions in the village.

### **9 Awareness about Sanitation**

It may be observed that a majority i.e. 80 percent of the households are aware of the importance of sanitation, while 20 percent are unaware of the importance of sanitation.

### **10 Access to Toilet within Home Premises**

It is clear that a majority i.e. 82.75 percent are not having toilets within the home premises while around 17.00 percent is having toilet facility at home.

### **11 Type of Toilet Facility Being Used by Households with No Toilet at Home**

It may be observed that a majority i.e. 41.23 percent households go for open defecation in the open fields while 32.70 percent use the community sanitation complex for defecation. The public lavatory is used by 26.07 percent. It may be inferred that since the majority of households in Vasadi village i.e. 82.75 percent do not possess a toilet at home, it is the responsibility of Panchayat to build and maintain clean, functioning toilets in the village. It should also persuade villagers to use these toilets instead of indulging in open defecation.

### **12 Reasons for not having Toilet Facility at Home**

It is clear that a majority i.e. 40.28 percent households have been habituated for open defecation for generations while 14.22 practice open defecation as it is free of cost. More than one-fourth of the households i.e. 26.07 percent did not build a toilet at home as it gives a bad smell. It may also be observed from the table that 9.95 percent households did not build toilets due to poverty/lack of financial resources, while 9.48 percent considered it as a bad omen to have a toilet at home and against the prescriptions of Vastu (traditional Indian scientific method followed in house construction). These households are superstitious and felt that toilet would surely bring ill luck and misery to household members.

Thus, it may be inferred that government should provide adequate subsidies, material, toilet pans, masonry support and know how to poor households who are willing to build toilets to reduce open defecation and benefit from the positive externalities of toilet use. Social workers should educate these rural households about the dangers of ill health due to unsanitary conditions caused by their age-old habit of open defecation and benefits of clean sanitation to make them build and use toilets a home. They could also remove, by proper motivation and counseling, these superstitions among the households about having a toilet at home and inhibitions of vastu.

### **13 Type of Toilet Technology Used**

It is clear that a majority of households i.e. 82.75 percent did not have a toilet at home and hence go for open defecation causing massive unsanitary conditions in the village, while only 17.25 percent possess

toilet at home. It may be inferred from the data that villagers should be encouraged to use the twin-pit pour flush method of toilet technology developed by Sulabh International as it is a sustainable and very environment-friendly method compared to septic toilets used in Andhra Pradesh. Septic toilets, unlike twin – pit pour flush technique, require periodic cleaning and safely disposing of which otherwise will contaminate water bodies and an environment. But, unfortunately, safe disposal of fecal matter is not practiced in Andhra Pradesh.

#### **14 Distribution of Sample Households Possessing Toilet by Type**

It can be clearly seen from the data that nearly 77 percent use a septic tank with the bottom sealed with cement which requires being cleaned up once it gets filled whereas 23 percent use a septic toilet with the bottom open to the soil at the bottom. It may be inferred from the data that septic tank technology is not an environmentally sustainable method as it requires periodic cleaning and safe disposal in a scientific method without harming the local environment. The definite solution for this vexing problem is to connect all septic toilets through underground sewerage system that is connected to an incinerator to safely dispose of the excreta by converting it to biogas and fertilizer. This is the tested and proven method in all western nations who have been able to convert their rural and urban spaces into clean and hygienic habitations by using incinerator technology on a very large scale.

#### **15 Distribution of Sample Households by Method of Disposal of Child Feces**

It can be clearly seen from the data that more than 61 percent reported that they always threw it in the drain or on the road while nearly 10 percent threw it on the garbage dump. It shows only 2 percent disposed of it properly / safely in the toilet. It can be inferred from the data that there is an urgent need for social workers to motivate the lady members of the households about the serious dangers of insanitation caused by throwing child feces on roads, garbage dumps and in drains. They should be counseled that the environmentally safe method of disposal is to dispose it inside the household toilet with proper flushing.

#### **16 Distribution of Households by Use of Public Latrines**

It may be observed that a majority i.e.78.82 percent of the households do not use public latrines while only 21.18 percent use them. It may be inferred from the data that cleaner and well maintained public toilets are the urgent need of the day and they should be built and maintained by authorities in sufficient numbers to reduce open defecation.

#### **17 Distance of Sample Households by the Distance of Public Latrine**

It is clear that a majority i.e. 81.48 percent walk 200 to 400 meters to access to a public latrine while 18.52 percent households need to walk only up to 200 meters to access the facility.

#### **18 Distribution of Sample Households by Distance for Open Defecation**

It is clear from the data that a majority of sample households i.e. 40.39 percent need to walk between 400 to 800 meters for indulging in open defecation while 37.65 percent walk up to 200 to 400 meters. On the other hand, it can be seen that 8.24 percent walk less than 100 meters for defecating in open while 7.84 percent walk more than 800 meters. The data indicate that in Vasadi village open defecation takes place on a large-scale due to the absence of awareness about the dangers of resulting insanitation and health hazards. It is observed that households possessing a toilet at home, especially male members, do indulge in open defecation due to their old habit and due to fear of getting the septic tank filled fast. It may be

inferred that the villagers need counseling and motivation by social workers about dangers of deadly pathogens released into village environment due to open defecation which will cause diseases like diarrhea, jaundice, dengue, viral fevers etc.

### 19 Restricted Use of Toilets at Home by Households

It may be observed that in a majority of sample households i.e. 34.09 percent the toilet is used by all family members at night time only while in 31.82 percent households only ladies use it at night time only and not during the day. Only children use it in 22.73 percent and in 11.36 percent all members of the family use it day and night.

It can be inferred from the data that social workers have also to work with households possessing toilets at home to motivate them to use their toilets and avoid open defecation by educating them about the dangerous pathogens released into nature as a result of open defecation causing deaths due to diarrhea, jaundice, dengue etc.

### 20 Reasons for Restricted Use of Toilet within Premises

It may be clearly observed that a majority of households i.e. 50.00 percent use the toilet infrequently to avoid filling of the septic tank while 31.82 percent do not use the home toilet as open defecation is more comfortable and also free of cost. On the other hand, 18.18 percent households avoid it due to bad smell and prefer open defecation in open fields. It may be inferred from the data that households should be provided with cost effective and efficient methods of cleaning toilets to encourage them to use regularly without worrying about the fear that it will be filled quickly.

### Multiple Regression Analysis

The following is the estimated best fit equation as per the OLS criterion adopted.

$$Y = \alpha + \beta_1 D_1 X_1 + \beta_2 X_2 + \beta_3 D_2 X_3 + \beta_4 D_3 X_4 + \beta_5 D_4 X_5 + \beta_6 X_6 + \beta_7 D_5 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} D_6 X_{10} + \beta_{11} X_{11} + \beta_{12} X_{12} + \beta_{13} D_6 X_{13} + \beta_{14} D_6 X_{14} + \beta_{15} D_6 X_{15} + \beta_{16} D_6 X_{16} + U_1$$

where Y is dependent variable (Total annual health expenditure of the Households),  $\alpha$  is constant,  $\beta$  is regression coefficient of respective independent variables, **D** is dummy and the independent variables are as follows:

X <sub>1</sub>	Religion	X <sub>9</sub>	Literacy of Head of HH
X <sub>2</sub>	Social Status	X <sub>10</sub>	Occupation of Head of HH
X <sub>3</sub>	Land Holding size	X <sub>11</sub>	No of Rooms
X <sub>4</sub>	Type of Family	X <sub>12</sub>	Plinth Area
X <sub>5</sub>	Family Size	X <sub>13</sub>	Type of House
X <sub>6</sub>	Annual Income	X <sub>14</sub>	Drinking water source
X <sub>7</sub>	Sex	X <sub>15</sub>	Drainage system at home
X <sub>8</sub>	Age	X <sub>16</sub>	Toilet Facility at home

**Table 1.** The estimated regression equation is

Y=	-2205.730 +	0.18 X <sub>1</sub> *	-0.88 X <sub>2</sub> ***	-0.44 X <sub>3</sub> **	-0.38 X <sub>4</sub> *	+0.69 X <sub>5</sub> ***	-0.46 X <sub>6</sub> *	-0.55 X <sub>7</sub> *	+0.53 X <sub>8</sub> *	
		(3.43)	(0.98)	(1.58)	(3.74)	(0.84)	(4.47)	(4.36)	(5.73)	
	-0.64 X <sub>9</sub> *	+0.35 X <sub>10</sub> *	+0.29 X <sub>11</sub> *	+0.73 X <sub>12</sub> *	+0.14 X <sub>13</sub> ***	-.46 X <sub>14</sub> *	-0.43 X <sub>15</sub> **	+0.62 X <sub>16</sub> *		
	(3.82)	(10.17)	(4.27)	(5.69)	(0.53)	(8.53)	(2.35)	(5.66)		
<b>ANOVA</b>										
		<i>Df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>				
Regression		16	3211604171	430725260.7	19.6928926	.00006				
Residual		238	4344270790	18253238.61						
Total		254	11555874961							
*	Significant at 1 percentage level									
**	Significant at 5 percentage level									
***	Significant at 10 percentage level									

**Table 2.** Regression Statistics

Multiple R	0.789
R Square	0.624
Adjusted R Square	0.598
Standard Error	42.38
Observations	255

**Results Based on Linear Multiple Regressions:**

The estimated model explains 59 percent variation in the dependent variable and its *F* value is 19.70 and it is significant at 1 percent level. Out of 16 selected independent variables, we found that 11 variables (X1, X4, X6, X7, X8, X9, X10, and X11) are found to be statistically significant at one percent level.

The following model has been selected to estimate the impact of certain selected independent variables on the annual health expenditure of the household. It is hypothesized that the health expenditure, by and large, depends on the income of the household. However, recent research shows that much increase in income is not automatically increasing the health expenditure of the households. There are other barriers like Social, cultural and marketing factors that influence. Thus, it is hypothesized that apart from income, other socio-cultural factors are important determinants of nutrition status.

**Policy Implications**

- Water and drainage should be developed to achieve 100 percent sanitation coverage by entrusting Panchayati Raj institutions and local administration the responsibility of operation and maintenance of water supply and sanitation.
- Total elimination of dry latrines and the inhuman scourge of manual scavenging by converting all existing dry latrines to low-cost sanitary latrines.

- Total Sanitation Campaign was introduced by the government as a demand driven low-cost sanitation approach instead of being imposed from the top by the government.
- Component of subsidy is inadequate for poor households to contemplate construction of toilets. Demand for toilets declines whenever it is linked to community contribution.
- Involvement of NGOs should play a key role in encouraging the habit of sanitation and make it demand driven instead of imposing it by the government from the top. NGOs played a key role in increasing the coverage of sanitation to an impressive level in Bangladesh. Even private sector and community participation should be encouraged to enhance the sanitation coverage.
- Due to bottlenecks in the governance lot of money meant for making toilets remains unspent in many states even though the pent-up demand for toilets is much higher than their supply.
- Use of electronic media for disseminating information and educating the people about the tremendous benefits of clean sanitation and safe drinking water for preventing waterborne diseases and deaths especially among children.
- Improving sanitation in rural areas through IEC programs and introducing the concept of ECOSAN – the ecological sanitation or environmental sanitation which basically is a mechanism to recycle urine and excreta matter into fertilizer and fuel as already successfully demonstrated by an NGO run by Mr. Nandan Nilakeni in Bangalore.
- Recycling the treated effluents for horticulture, irrigation, water harvesting and transport system for solid waste disposal through sewers and drains. Technological innovations to improve the reusability of the recycled waste.
- By using IEC programs there is urgent need to introduce organizational reforms, changing attitudes and behaviour with full participation of women.
- Community management of services and strengthening local panchayat raj institutions.
- Sound financial practices and application of appropriate technology for increasing demand for toilets.
- Diarrhea occurs very less among children using filtered/purified water with access to a clean toilet.
- Child feces, animal excreta like horse excreta has a higher concentration of pathogens and hence more dangerous. Several studies have shown that strong association between the incidence of diarrhea in a household with children defecating in open living areas.
- The increase in the amount of water used and wide coverage of sewage facility contributes to better hygiene and elimination of bacteriological contamination.
- Clean toilets in village schools and affordable sanitary napkins for poor girls improve their school attendance and their menstrual hygiene and general health.
- TSC provides platform for innovation and creative solutions like cost effective and affordable toilets, water saving toilets made of fibreglass at Rs. 60 each, toilets made of clay from village resources in environment friendly ways creating jobs, vacuum pressure technology, Rural Sanitary Marts (RSMs), public-private partnerships in building and maintaining clean affordable Community Sanitary Complexes (CSCs).
- Polluter paying for rectifying damage to environment should be adopted to finance waste disposal programmes.
- Protection of environment and safeguard of health through the integrated management of solid waste and water resources.

## Tables

**Table 3.** State-wise distribution of Rural Population by No Latrine Used (Per 1000)

Sl. No	State	No latrine used (rural)
1	Orissa	96.1
2	Madhya Pradesh	94.6
3	Uttar Pradesh	90.6
4	Bihar	89.4
5	Karnataka	88.9
6	Andhra Pradesh	88.5
7	Tamil Nadu	88.5
8	Rajasthan	87.0
9	Maharashtra	85.8
10	Haryana	84.5
11	Gujarat	79.9
12	West Bengal	76.1
13	Punjab	67.9
14	Southern	67.3
15	North-Western	61.7
16	Assam	24.7
17	Kerala	23.1
18	North-Eastern	18.1
19	India	82.5

Source: NSSO, 54<sup>th</sup> Round

**Table 4.** State-wise distribution of urban households by no latrine used (per 1000)

Sl. No	State	No latrine used: Urban
1	Bihar	45.3
2	Madhya Pradesh	45.2
3	Orissa	35.8
4	Haryana	32.9
5	Tamil Nadu	32.5
6	Andhra Pradesh	30.8
7	Karnataka	30.0
8	Uttar Pradesh	28.2
9	Southern	27.9
10	Rajasthan	25.5
11	Gujarat	21.1
12	Maharashtra	15.8
13	West Bengal	15.2

14	Punjab	14.8
15	North-Western	11.9
16	Kerala	5.1
17	North-Eastern	2.4
18	Assam	2.0
19	India	25.5

Source: NSSO, 54<sup>th</sup> Round

**Table 5.** State-wise distribution of urban households by use of Service Latrine in India (per 1000)

Sl. No	State	Service Latrine
1	Assam	20.1
2	Uttar Pradesh	17.7
3	North-Western	13.5
4	North-Eastern	10.4
5	Haryana	9.7
6	Orissa	7.7
7	Madhya Pradesh	6.2
8	Bihar	5.2
9	Rajasthan	5.2
10	West Bengal	5.1
11	Kerala	3.6
12	Tamil Nadu	3.0
13	Gujarat	1.8
14	Karnataka	1.8
15	Maharashtra	1.6
16	Punjab	1.3
17	Andhra Pradesh	1.2
18	Southern	0.4
19	India	5.9

Source: NSSO, 54<sup>th</sup> Round

**Table 6.** State-wise distribution of rural households by use of septic tank toilet in India (per 1000)

Sl. No	State	Septic Tank
1	Kerala	26.0
2	Southern	23.1
3	Punjab	16.8
4	North-Western	16.8
5	Gujarat	15.3
6	Maharashtra	11.6
7	Andhra Pradesh	9.3
8	West Bengal	9.0



9	North-Eastern	8.2
10	Tamil Nadu	7.9
11	Haryana	7.6
12	Assam	5.4
13	Bihar	4.5
14	Uttar Pradesh	4.5
15	Madhya Pradesh	3.4
16	Rajasthan	3.3
17	Karnataka	2.6
18	Orissa	1.7
19	India	7.5

Source: NSSO, 54<sup>th</sup> Round

**Table 7.** State-wise distribution of urban households by use of septic tank toilet in India (per 1000)

Sl. No	State	Septic Tank
1	Assam	61.1
2	West Bengal	55.8
3	Orissa	50.5
4	Southern	50.0
5	Kerala	48.8
6	North-Eastern	48.3
7	Bihar	45.2
8	Andhra Pradesh	42.9
9	Madhya Pradesh	40.3
10	Gujarat	33.8
11	Tamil Nadu	33.8
12	Rajasthan	33.3
13	Uttar Pradesh	32.2
14	Maharashtra	30.3
15	Punjab	23.4
16	Karnataka	22.0
17	North-Western	11.3
18	Haryana	7.5
19	India	35.2

Source: NSSO, 54<sup>th</sup> Round

**Table 8.** State-wise distribution of urban households by use of pour flush pit toilet in India (per 1000)

Sl. No	State	Pour flush Pit
1	Kerala	25.5
2	Rajasthan	19.3
3	Karnataka	18.1
4	Haryana	16.5
5	Uttar Pradesh	10.7
6	North-Western	10.1
7	Gujarat	7.2
8	West Bengal	7.2
9	Punjab	6.5
10	Tamil Nadu	6.5
11	Madhya Pradesh	4.9
12	Southern	4.7
13	Andhra Pradesh	4.6
14	Maharashtra	4.6
15	Bihar	3.6
16	Orissa	3.4
17	Assam	3.3
18	North-Eastern	2.2
19	India	8.4

Source: NSSO, 54<sup>th</sup> Round

**Table 9.** State-wise distribution of rural households by use of sewerage system in India (per 1000)

Sl. No	State	Sewerage System
1	Assam	13.1
2	North-Eastern	6.4
3	Gujarat	1.8
4	Haryana	1.3
5	Punjab	1.3
6	Kerala	0.9
7	West Bengal	0.7
8	Tamil Nadu	0.6
9	North-Western	0.6
10	Bihar	0.5
11	Maharashtra	0.3
12	Karnataka	0.2
13	Uttar Pradesh	0.2

14	Andhra Pradesh	0.1
15	Orissa	0.1
16	Rajasthan	0.0
17	India	0.8

*Source: NSSO, 54<sup>th</sup> Round*

**Note;** MP and Southern not included

**Table 10.** Demographic, Socio-economic and Health Profile of Andhra Pradesh State as Compared to All India

Sl. No	Item	Andhra Pradesh	India
1	Total Population (Census 2011) in million	84.58	1210.85
2	Decadal Growth (Census 2011) (%)	11.1	17.64
3	Crude Birth Rate (SRS 2011)	12.5	21.6
4	Crude Death Rate (SRS 2011)	7.5	7.0
5	Total Fertility Rate (SRS 2011)	1.8	2.5
6	Infant Mortality Rate (SRS 2011)	43	44
7	Maternal Mortality Ratio (SRS 2007-09)	134	212
8	Sex Ratio (Census 2011)	993	940
9	Population below Poverty line (%)	11.1	21.8

*Source: Census 2001, census 2011, SRS 2007, Census 2004-06.*

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