

Water and Sanitation

The Problem

Diarrheal disease caused nearly 1.7 million deaths globally in 2016. Nearly 0.8 million of these deaths occurred in India of which 90% were due to unsafe drinking water, sanitation and hygiene according to estimates by the Global Burden of Disease 2016 (GBD 2016). In Andhra Pradesh (AP) over 30 thousand deaths were caused by diarrheal disease and intestinal infections (mainly typhoid and paratyphoid) in 2016, constituting 8.0% of all deaths in the state according to GBD 2016.

To address these issues 4 interventions are analyzed for the state of AP. Benefits and costs are presented as a ratio of annualized benefits and annualized costs (benefit-cost ratios (BCRs)) over the expected useful life of each intervention.

Solutions

Interventions	BCR	Benefits (INR crores)	Annualized costs (INR crores)
Improved drinking water supply - urban	4.7	1,079	228.02
- rural	2.6	1,135	440.32
Behavioral change campaign for household point-of-use treatment of drinking water	3.0	1,035.6	342.2
Improved sanitation - urban	4.0	2,199.6	544.1
-rural	5.3	14,201.1	2,668.3
Behavioral change campaign for use of existing sanitation facilities	1.4	95.9	67.4

Total costs annualized and total benefits discounted at 5%

The full paper by economist **Bjorn Larsen** is available on www.appriorities.com/water-and-sanitation.

Improved Drinking Water Source

The Problem

About 73% of households in Andhra Pradesh had access to an improved drinking water source in 2015-16 according to the National Family Health Survey 4 (NFHS 4). Only 19% of households practiced point-of-use (POU) treatment of their drinking water in 2005-06 (Andhra Pradesh & Telangana), mainly by filtering (11%) and boiling (8%) (NFHS 3). Moreover, 14% of population in Andhra Pradesh (and Telangana) had more than 30 minutes round-trip to their drinking water source in 2005-06 (NFHS 3), particularly affecting women and children.

The Solution

The intervention for urban households without an improved drinking water source is having piped water to dwelling. For rural households without an improved drinking water source or that have more than 30 minutes round-trip to their drinking water source is having Tube well/borehole.

Costs

Annualized cost of improved drinking water supply is estimated in the range of Rs. 1,233 – 1,753 per household. This includes initial capital cost of piped water supply or tube well/borehole and annual operations and maintenance cost (O&M).

For urban areas the annualized cost of improved drinking water supply is estimated at Rs. 228.02

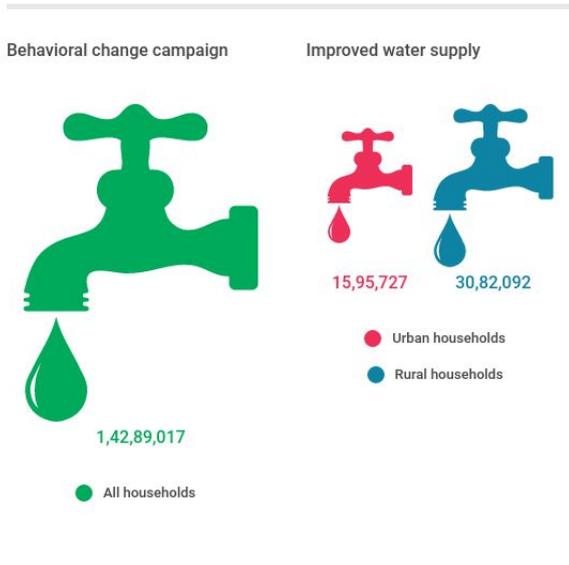
crores per year and for rural areas annualized cost is estimated at Rs. 440.32 crores per year.

Benefits

The intervention would benefit about 4.7 million households. The largest benefits are avoided mortality and productivity benefits in terms of time savings from water source closer to dwelling.

For urban intervention annualized benefits are estimated at Rs. 1,079 crores per year and for rural area annualized benefits are estimated at Rs. 1,135 crores per year.

Coverage of water interventions



Household point of use treatment of drinking water

The Problem

Only 19% of households in Andhra Pradesh (and Telangana) practiced appropriate methods of point-of-use (POU) treatment of drinking water a decade ago, compared to over 20% nationwide in India according to the NFHS 3 (2005-06). The main appropriate methods in Andhra Pradesh were the use of a water filter (11%) and boiling (8%). POU treatment by appropriate methods is likely to have increased somewhat, postulated at 23% currently.

The Solution

Given the low rate of POU treatment by appropriate methods, and that water filter was the most common method in Andhra Pradesh, the intervention is a behavioral change campaign (BCC) that promotes household POU treatment of drinking water with water filter.

Costs

The main costs of POU treatment of drinking water is the water filter (Rs. 2,000), parts replacement (Rs. 500 per year), and cost of time spent on filtering water (Rs. 434 per year).

This intervention targets 1.4-2.8 million households and the cost for them to start POU treatment by filtering of drinking water has been factored. Additionally, cost of BCC program promoting POU treatment of drinking water is undertaken once over the assumed 5 years of useful life of the water filter. Total annualized cost of this intervention is Rs. 342.2 crores.

Benefits

It is estimated that about 1,200-2,400 deaths and 2.6-5.1 million cases of diarrheal illness will be averted per year. Total value of the health and productivity benefits of the intervention is estimated at Rs. 1,035.6 crores per year.

Improved Sanitation

The Problem

About 61% of households in AP had a sanitary toilet facility in 2015 according to the Swachhta Status Report 2016 (MSPI/GOI, 2017). The same report also reveals that 2.2% of persons with a sanitary toilet facility continued to practice open defecation (OD). Additionally, 39% of households had no sanitation facility and practiced OD in 2015. 54% of households had access to an improved non-shared sanitation facility in 2015-16 according to the NFHS 4. Thus about 7% of households shared a sanitation facility with other households in 2015.

The government has been/is undertaking a substantial drive for household sanitation and eradication of open defecation (OD) with an incentive up to Rs 12,000 to eligible households.

The Solution

The most common household sanitation facility in Andhra Pradesh is a flush/pour-flush toilet in both

urban and rural areas. Therefore, this intervention targets 95% household coverage with improved, non-shared sanitation is applied.

Costs

Costs of household sanitation include initial capital cost, periodic emptying of pit or septic tank (once in 5 years), annual operations and maintenance (O&M) cost, cost or time for cleaning of sanitation facility, and cost of sanitation promotion programs by the government (Rs. 600 per household).

Annualized cost per household is estimated at Rs. 5,577 for rural households and Rs. 8,229 for urban households. Total annualized cost of intervention is estimated at Rs. 3,212 crores (Rs. 544.1 crores for urban areas and Rs. 2,668.3 crores for rural areas) based on estimated for 5.4 million households in the state.

Coverage of sanitation interventions



Benefits

It is estimated that over 7,000 deaths and 15.4 million cases of diarrheal illness will be averted per year due to this intervention.

The total value of the annualized health and productivity benefits of the intervention is estimated at Rs. 2,199.6 crores for urban areas and Rs. 1,420.1 crores for rural areas.

Promotion of use of Sanitation Facilities

The Problem

The Swachhta Status Report 2016 found that 2.2% of household members continue to practice Open Defecation (OD) after construction of sanitation facility. Non-use is more prevalent in rural areas (2.7%) than in urban areas (1.1%).

The Solution

Faced with a situation of OD among households with sanitation facility, the intervention is a behavioral change campaign (BCC) that promotes the consistent use of existing sanitation facilities.

Costs

The BCC program promoting the use of existing household sanitation is repeated every 3 years over the useful life of the sanitation facilities. Annualized BCC program cost per household ranges from Rs. 11-12 for the “low” intensity program to Rs. 176-190 for the “high” intensity program. This is directed at all households that currently have a sanitary toilet facility as reported by the Swachhta Status Report 2016. Total annualized cost of mid intensity BCC program promotion cost is estimated at 42.8 crores.

The two most important reasons in AP some household do not use their sanitation facility and continue to practice OD were personal preferences (17%) and lack of cleanliness/insufficient water (62%) NSS 69 (2012). Factoring these two additional costs to the intervention it is estimated that Rs. 24.5 crores would be total annual cost. The total annualized cost (both BCC program and additional cost) of this intervention is Rs. 67.4 crores.

Benefits

The intervention would end OD among 72-145 thousand household members. It is estimated cases of 14-28 deaths and about 30-61 thousand cases of diarrheal illness will be averted per year.

The total value of the annualized health and productivity benefits of the intervention is estimated at Rs. 95.9 crores.