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Reports

# Water as a social determinant of health: bringing policies into action

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Water is one of the social determinants of health and a key factor towards improving health outcomes and inequalities. Access to safe and adequate water has been identified as an essential component for protecting, maintaining and promoting public health and reducing the total burden of diseases. Though India has made substantial progress in increasing access to safe drinking water in rural areas through household tap connections, there is a lack of contemporary evidence reflecting the progress achieved so far. A desk review of India's schemes, programmes, and policies on access to drinking water was undertaken for review. Programme and policy documents from various central government websites such as the Ministry of Jal Shakti, Department of Drinking Water and Sanitation, Jal Jeevan Mission, and Central Water Commission websites were reviewed. The paper focuses on the recently launched Jal Jeevan Mission (JJM) in addressing the identified gaps of the former initiatives in rural areas. The broad vision of JJM also aims to reduce the incidence of acute diarrhoeal diseases. It was found that with the launch of JJM in 2019, tap water connections in rural households have increased from 16.69% (2019) to 62.79% (2023). The Government of India (GoI)'s commitment and citizen-centric approach to decentralised governance in providing safe drinking water to all is reflected in the financial allocations made under the JJM to states and fifteen finance commission (FC-XV) grants. The review highlights the need for intersectoral coordination across the levels to realise better results and health outcomes.

A substantial amount of research, particularly in the last two decades, indicates that social factors, in addition to medical care, have a significant influence in determining health across a wide range of indicators. This highlights the fact that in addition to medical care, there are social conditions in which people are born, grow, work, live, and age that influence health outcomes.[1] This emphasises the need to address social determinants of health which are crucial for improving health and reducing health disparities, necessitating actions with a multisectoral approach.

Social determinants of health are defined across domains spanning clean air, health care, food, education, decent working conditions, adequate housing, clean water and standard of living.[2] Access to safe drinking water is one of the social determinants of health and a key factor towards improving health outcomes and inequalities.[3] The importance of access to safe water has been accepted as an international agenda and priority, which was emphasised through United Nations, UN-driven global goals, i.e., Millennium Development Goals, MDGs (2002-15), followed by a call for action towards sustainable health systems through the Sustainable Development Goals, SDGs (2016-30). MDGs included access to water and sanitation under target 7C aimed to "halve the proportion of people without sustainable access to safe drinking water and basic sanitation" which was continued as a global goal under redesigned SDGs (Goal 6) to provide "clean water and sanitation for all".[4,5]

India's National Health Policy 2017, following the agenda of achieving SDG targets towards its path to attain Universal Health Coverage (UHC), included "safe drinking water and sanitation to all" as one of the cross-sectoral goals related to health.[6]

a Joint first authorship.

b Joint first authorship.

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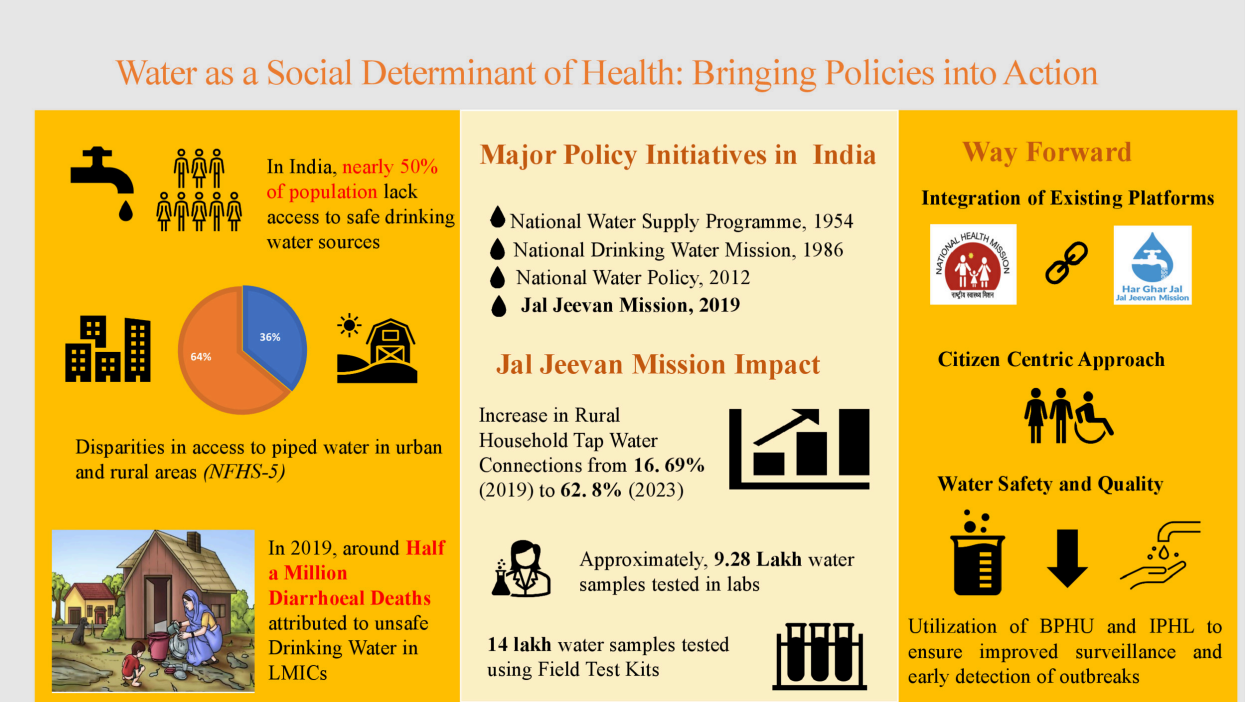


**Figure 1. Graphical overview of the report**

*NFHS-5 – National Family Health Survey 5; LMICs – Low and Middle Income Countries; BPHU – Block Public Health Unit; IPHL – Integrated Public Health Lab*

With SDGs in place and a priority across the globe, the nations have demonstrated improved access to safe drinking water. However, it has yet to reach the SDG targets, with 26% (nearly 2 billion) of the world's population reporting a lack of access to safe drinking water.[7] In the Indian context, out of the 1.3 billion population, around 50% of the population doesn't have access to safe drinking water, which is essential for human development and the building of a healthy nation.[8,9] The access to safe drinking water has increased by almost ten per cent in the last decade, from 85.5% in 2011 to 95.9% in 2021.[10,11] Focussing on geographical disparities, the Joint Monitoring Programme (JMP) 2020 Report showed huge variations in rural and urban areas for access to basic water services.

Evidence shows that lack of access to safe water sources is the leading cause of infectious diseases like diarrhoea, Cholera, Dysentery, Hepatitis A, Typhoid, and Polio. It is also one of the primary causes of illness and death among children under 5 in LMICs.[12,13] An estimated 1.2 million people in the world die prematurely because of unsafe drinking water, which accounts for 2.2% of deaths globally, with 6% of deaths in LMICs alone.[14]

Safe and adequate water services have been identified as essential component for protecting, maintaining and promoting public health and reducing the total burden of disease globally.[15,16] Increased access to safe drinking water would not only improve health outcomes but also contribute towards developing resilient communities and enhancing the country's economic growth.

Though India has made substantial progress in increasing access to safe drinking water in rural areas through household tap connections, there is a lack of contemporary evidence reflecting the progress achieved so far. Addressing this evidence gap, the paper informs the initiatives taken by the nation and the current scenario of drinking water access in India. It focuses on interventions and newer reforms addressing the identified gaps of the former initiatives in rural areas. The paper aims to provide a comprehensive picture of the links between water, health, and development, with actionable recommendations for government. Refer to Figure 1 for an overview of the report

## APPROACH

A desk review of India's schemes, programmes and policies on access to drinking water was undertaken for review. Programme and policy documents from various central government websites such as the Ministry of Jal Shakti, Department of Drinking Water and Sanitation, Jal Jeevan Mission, and Central Water Commission websites were reviewed. Additionally, to understand the disease burden due to the use of contaminated drinking water, some of the primary studies were reviewed to provide a comprehensive picture of the links between water, health, and development, with actionable recommendations for government.

### CURRENT SCENARIO OF DRINKING WATER AND DISEASE BURDEN

WHO defines water as safe for drinking if it is from an "improved water source," which includes household connections, public standpipes, boreholes, protected dug wells, protected springs and rainwater collections. "Access to safe drinking water" implies the availability of at least 20 litres of water per person per day from an "improved" source within 1 km of the user's dwelling.[17] As per NFHS-5

(2019-21), 95.9% of households had access to improved sources of water, out of which 48.5% are using primarily piped water with wide variations in urban (67.5%) and rural (38.1%) households.[11] The percentage of households having improved sources of water has increased from 89.9% in 2015-16 to 95.9% in 2019-20.[11,18] With improved access to safe drinking water, the proportion of the population travelling 30 minutes or more to collect drinking water has reduced from 6.4% to 1.2% between NFHS-4 and NFHS-5.[11, 18]

The availability and quality of water can vary significantly across different communities, regions, and socioeconomic groups. Communities facing poverty, residing in rural areas or informal settlements, often encounter difficulties in access to clean water and adequate sanitation, disproportionately affecting vulnerable and marginalised populations.[19]

Water diseases are illnesses resulting from the direct consumption of contaminated drinking water or indirect contact with contaminated water through the skin. Fundamentally, water-related diseases are classified into four main classes: water-borne diseases, water-washed diseases, water-based diseases, and insect vector diseases. Waterborne diseases are transmitted through contaminated drinking water, often caused by human or animal waste. Diarrhoea is a common symptom of waterborne diseases, which can result in dehydration and even death. Examples of waterborne diseases include diarrhoea, cholera, amoebic dysentery, bacillary dysentery, cryptosporidiosis, typhoid, giardiasis, and hepatitis A.[20]

The estimated disease burden attributable to unsafe WASH practices is significant and accounts for 1.4 million deaths globally with 89% of deaths being from low- and lower-middle-income countries. The leading cause of mortality is diarrhoea, accounting for over 1 million deaths, followed by acute respiratory infections and undernutrition. Out of which, unsafe drinking water alone contributed to 50% of diarrhoeal deaths.[21] Children under the age of five bear the brunt of the global burden of diarrhoeal disease, contributing approximately 69% of the total WASH-related disease burden. (*Reported burden of 273000 diarrhoeal deaths out of a total of 395000 WASH-related deaths in this age group*).

Lack of clean water for washing can result in water-washed diseases like scabies and conjunctivitis. Water-based diseases are caused by host organisms that develop into human parasites, including schistosomiasis and dracunculiasis. Insufficient water intake or limited access to water can result in dehydration, which negatively impacts physical and cognitive abilities as well as bodily functions. The presence of high levels of arsenic in groundwater is a significant concern affecting over 226 million individuals in over 100 countries. Arsenic exposure can lead to skin lesions and long-term health problems, including cancer, neurological disorders, cardiovascular diseases, diabetes, and impaired cognitive development in children.[22]

## EVOLUTION OF SCHEMES AND INITIATIVES TO IMPROVE THE AVAILABILITY, ACCESS AND QUALITY OF WATER

The government of India has undertaken several initiatives to ensure safe drinking water for all its citizens, beginning with the National Water Supply Programme, launched in 1954 as part of the first five-year plan (1951-56).[23] Over the last seven decades, the drinking water supply schemes and programmes have evolved to improve the availability and access to clean drinking water (Figure 2). Focussing on areas with low availability of water and areas prone to waterborne diseases, GoI launched the Accelerated Rural Water Supply Programme (ARWSP) in 1972 to supplement the efforts of States to provide safe drinking water to the community. Providing scientific input and cost-effective technological solutions to address water scarcity, the National Drinking Water Mission (NDWM), popularly known as the Technology Mission, was launched in 1986. To institutionalise the mechanisms and develop a legal framework for resolving the issues and challenges related to water management in India National Water Policy was drafted in 2012.[24]

National Health Policy 2017 has envisaged access to safe drinking water and sanitation to all as one of the cross-sectoral goals related to health. NRDWP was reformed and incorporated under Jal Jeevan Mission (JJM), which was launched by the Hon'ble Prime Minister on 15$^{th}$ August 2019 to provide Functional Household Tap Connection (FHTC) to every rural household, i.e., *Har Ghar Nal Se Jal* (HGNSJ) by 2024.[23] Until 2019, efforts were focused on providing a safe drinking water supply to the rural population either through hand pumps, protected wells, or piped water supply with public stand posts. With the launch of JJM, the focus has shifted to providing functional household tap water connections to each rural household. Under JJM, the government is investing in the development of water infrastructure to supply piped water to rural households. With the launch of JJM, tap water connections in rural households have increased from 16.69% in 2019 to 62.79% by June 2023, with 1220 lakh new household tap water connections being provided as of 8$^{th}$ June 2023 (Figure 3).[25]

JJM not only focuses on providing tap water connections but gives equal importance to the quantity and quality of water supplied through these tap water connections by creating structural systems to ensure the quality of water supplied. The water quality Monitoring and surveillance system envisaged under JJM has been instrumental in ensuring the quality of water by testing water samples at the Village/ Gram panchayat level through field testing kits by trained members of the Village Water sanitation committee (*Paani Samiti*) and through laboratories established at Block and District level. An integrated management information system has been developed by the Department of Drinking Water and Sanitation (DDWS) for monitoring the physical and financial progress made under JJM. The system also monitors the Water quality testing laboratories and community surveillance by using Field testing kits. A real-time dashboard provides an updated status of the Lab and field testing to monitor the water quality (Figure 4).[25,26]

The output-outcome framework under JJM outlines the broad vision of the mission not only in terms of increasing

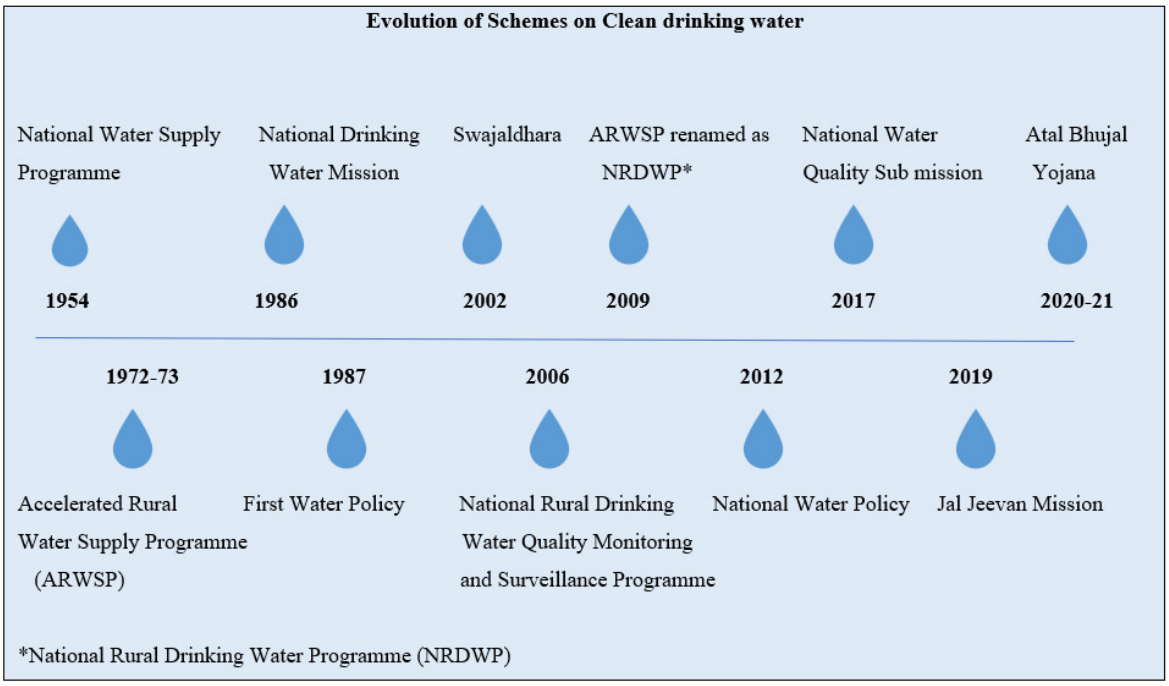


**Figure 2. Evolution of schemes for drinking water in India**

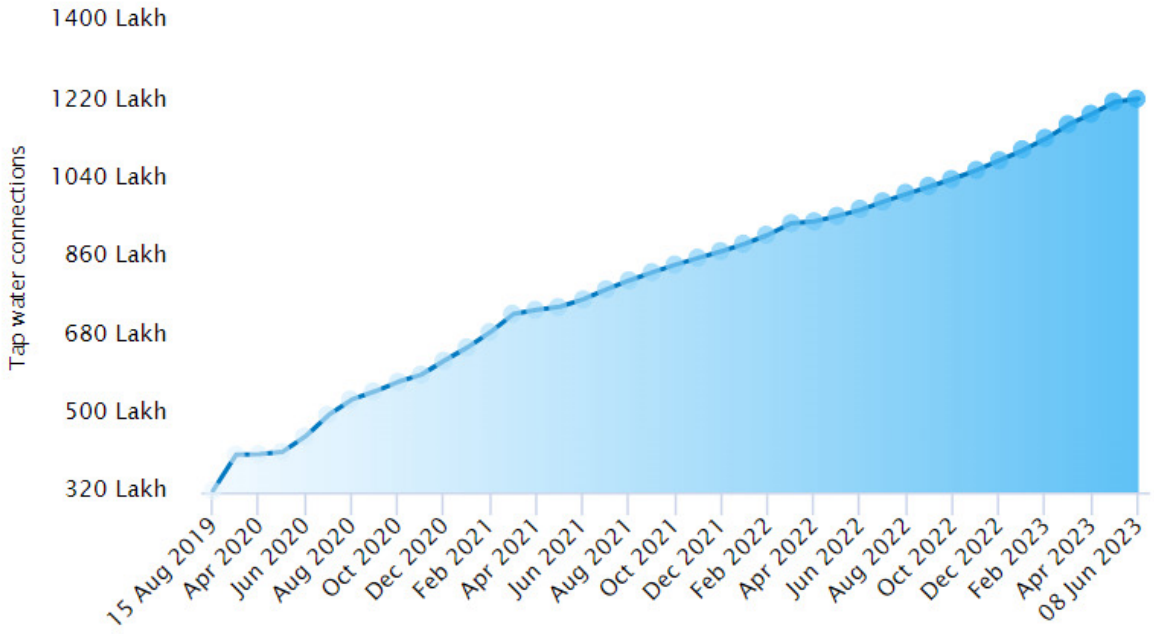


**Figure 3. Number of households with FHTC since launch of JJM**

Source: Jal Jeevan Mission Dashboard
JJM: Jal Jeevan Mission
FHTC: Functional Household Tap Connections

access to water but also reducing the incidence of acute diarrhoeal diseases reported and per cent reduction of waterborne diseases compared to the incidence reported in National Health Profile 2019.[23]

## DISCUSSION

Approximately 60% of deaths are caused by infectious diseases, specifically diarrhoea, schistosomiasis, trachoma, and intestinal helminths. Every year, between 1.5 and 2 million children lose their lives due to diseases associated

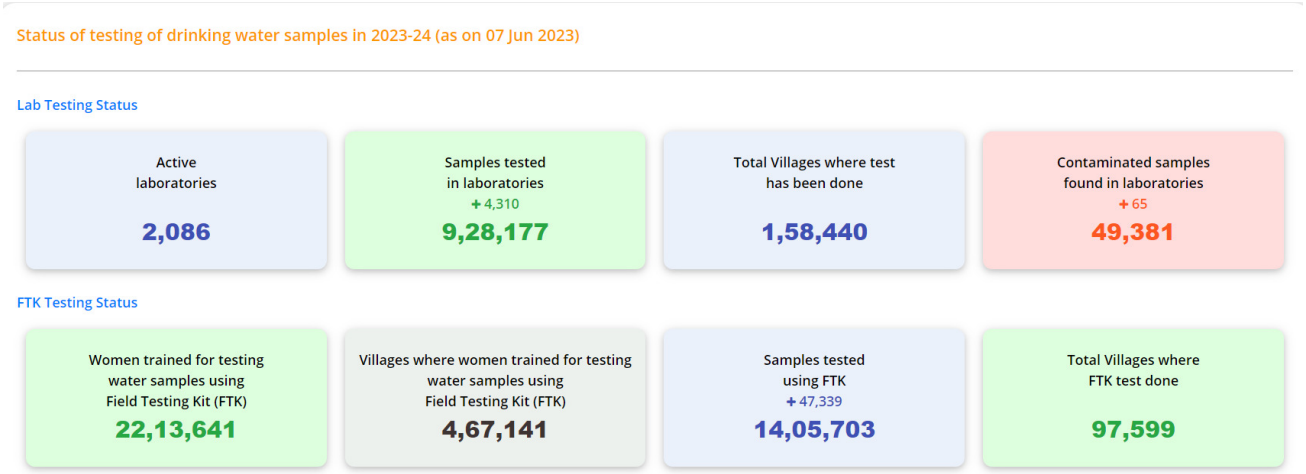


**Figure 4. Number of drinking water samples tested under JJM**

Source: Jal Jeevan Mission Dashboard (as of 7th June, 2023)
JJM: Jal Jeevan Mission

with water and sanitation, while countless others suffer from illness, pain, and discomfort. Inadequate and unsafe water sources and sanitation affect individuals of all ages, it disproportionately impacts the health and well-being of children.[27]

Recent NFHS 5 (2019-20) data show that access to safe drinking water is still challenging in rural areas with more than 60% of rural households lacking access to piped water. With the Launch of the GoI flagship scheme, Jal Jeevan Mission, a holistic approach has been adopted for improving accessibility to safe drinking water in rural areas, sanitation, and hygiene through functional tap connections, along with safe storage and handling of drinking water. The Mission has significantly improved access (16% in 2019 to 62% in 2023) to clean and safe drinking water across rural households in India. According to the Ministry of Drinking Water and Sanitation 2022 "JJM assessment" findings, functional tap connections were found in more than 80% of surveyed households, 95% of water samples had acceptable pH limits, and 93% of the samples were found to be free of bacterial contamination.[28] A study conducted by Kremer et al, based on a meta-analysis of 15 randomised controlled trials, estimates that successful implementation of the Jal Jeevan Mission and the provision of water free from microbial contamination could potentially avert 1.36 lakh deaths among children under the age of 5 annually.[29] Additionally, a recent study by the World Health Organization (WHO) assessed the potential health benefits of increased access to safe drinking water through the Jal Jeevan Mission. The study estimated that the mission could potentially avert 4 lakh diarrheal deaths and prevent 14 million DALYs (Disability Adjusted Life Years), resulting in cost savings of $101 billion (equivalent to 10,100 crore rupees).[30] While the Jal Jeevan Mission has significantly increased access to safe drinking water, it is crucial to evaluate the corresponding reduction in disease burden and other socioeconomic impacts.

Evidence from the past literature has established relation between access to clean drinking water and sanitation and the reduction in diarrhoeal diseases. A meta-analysis of 46 studies from developing countries showed that clean drinking water and sanitation have an additive effect on the reduction of diarrhoea-related morbidity in the population by 33% as compared to 25% and 32% by water supply and sanitation alone, respectively.[16] Another WHO modelling study on the health impacts of Swachh Bharat Mission Gramin (SBM-G) outlines the substantial impact of improved sanitation coverage on the reduction of diarrhoeal and protein energy malnutrition (PEM), stating 100% improved sanitation by 2019 can avert up to 3 lakh diarrhoeal and PEM deaths.[31]

Additionally, lack of access to clean water has a substantial impact on women's health and quality of life.[32] Women or adolescent girls are primarily responsible for carrying water from distant sources in both urban and rural areas.[11] Improved household water availability will reduce the disproportionate burden of fetching water on women and children, especially adolescent girls and help in developing resilient communities by reducing absenteeism from school and work, providing a safe environment, and cutting healthcare costs.

## CONCLUSIONS

Water safety and quality are basic for ensuring the development and well-being of the community, and the provision of its access directly contributes to health promotion and reducing poverty. Cognizant to this fact, the Government of India has a strong commitment to make safe drinking water available, affordable, and easily accessible. This is being driven with a citizen-centric approach, leveraging existing platforms for decentralised governance in providing safe clean drinking water to all. This is also reflected in the financial allocations made under the JJM to states and additional resources through FC-XV grants for water and sanitation through rural local bodies.

Over the past few years, India has made significant progress in ensuring access to safe drinking water, especially in rural areas. However, challenges still remain, and demand continued investments in water infrastructure development, such as water treatment plants, pipelines, and distribution networks. Innovation and the use of technology in water management can help to further improve the efficiency of water use and management. Articulating the recommendations from the National Health Policy 2017, the intersectoral coordination across the levels would not only optimise the health outcomes but also yield better results. Following the "Health in All" approach, convergence between health and relevant non-health sectors working on water, sanitation and health is needed for a more coordinated effort for optimal results and will also avoid duplication.

Community-based fora within existing platforms of the National Health Mission and Jal Jeevan Mission may also be connected to have an integrated approach towards access to safe drinking water as a complement to "*Health for All*". GoI has launched newer interventions of establishing *Block Public Health Units* (BPHUs) and *Integrated Public Health Laboratories* (IPHL) under the Pradhan Mantri Ayushman Bharat Infrastructure Mission (PM-ABHIM) at the block and district level with an objective of ensuring improved surveillance and early detection of outbreaks. These labs may also be utilised as a junction between NHM and JJM with the integration of existing stand-alone district and block-level water testing laboratories. Encouraging and involving local communities in water management and conducting awareness campaigns and education programs to promote the importance of water conservation and sustainable water use practices can ensure the long-term sustainability of water resources and help to create a water-conscious society.

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VS & AK & ND: Conceptualization. AK & ND: Supervision. ND, VS, RK, & VT: Original draft preparation. All authors contributed to Reviewing and Editing.

DISCLOSURE OF INTEREST

The authors completed the ICMJE Disclosure of Interest Form (available upon request from the corresponding author) and disclose no relevant interests.

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