

What's so hard about improving access to water and sanitation?

Safe drinking water and proper sanitation are critical to healthy human development. For much of the world's

poor, a lack of clean water has led to disease and high rates of premature death. Children often fail to thrive because illnesses sparked by the spread of fecal material and otherwise-contaminated water saps their ability to absorb nutrients. This can hurt long term cognitive and physi-

cal development. While development groups and gov-

ernments know that clean water matters, they don't know how to ensure everyone has it.

The World Bank is committed to ending extreme poverty and boosting shared prosperity. Providing clean, safe water to people wherever they live is critical to achieving these goals. A World Bank research team analyzed more than 130 water, sanitation and hygiene evaluations to understand what evidence there is for successful programs and what still needs to be learned. The researchers found that evidence is clear that improving sanitation and handwashing reduces diarrhea. The evidence is less clear when it comes to expanding services to large populations or changing behaviors, such as getting people to add chlorine to drinking water or to wash their hands. **More research and more innovative programs are needed to establish the path forward.**



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Context

Globally, some 630 million people lack access to safe drinking water and some 2.4 billion people—about one third of the world's population—do not have access to a toilet. Lack of clean water affects children in particular, because diarrhea depletes the body of key nutrients, leading to stunting and chronic malnutrition. Each year diarrhea kills around 760,000 children under five.

Despite the importance of clean water and sanitation for healthy kids, there hasn't been a systematic

review to identify and analyze the impact evaluation evidence in water and sanitation and draw lessons and a knowledge base for policymakers and development organizations. A World Bank research team, with support from the Strategic Impact Evaluation Fund (SIEF), conducted a systematic review of water and sanitation impact evaluations to provide a basis for future policymaking and research.

Evaluation

Researchers looked at studies that examined the effectiveness of water and sanitation programs, drawing from impact evaluation and medical databases, as well as repositories from research institutions like the World Bank, regional development banks, universities, non-governmental organizations and other research organizations working in this field. They limited the search to papers from 1969 and onward. The researchers identified 1,200 water and sanitation related studies out of about 850,000 studies in these databases and repositories.

Among these, the research team looked at impact evaluation studies, and limited their search to randomized controlled trials, experimental designs and quasi-experimental evaluation methods. To be included in the systematic review, studies had to have produced final results and these had to have been made

fully accessible. They also had to have a statistically-valid counterfactual. The research team didn't include qualitative evaluations, cost/benefit analyses, literature reviews or protocol studies.

In total, the team identified 136 rigorous impact evaluations and these were divided among five categories according to the types of interventions evaluated: water quality, water supply, sanitation, hygiene (handwashing), and the fifth was for evaluations that looked at programs with more than one type of intervention. More than 70 percent of the evaluations included in the systematic review were experimental, usually randomized controlled trials. The review looked at a range of factors for determining effectiveness, such as better access to water and better health.

Results

The rise in number of impact evaluations of water and sanitation programs reflects the relevance of water and sanitation for healthy human development.

About 80 percent of studies of water and sanitation issues were published over the past 16 years (starting in the year 2000), an indication of the increasing attention on the issue. In fact, in the last five years, impact evaluations accounted for nearly half of all studies that researchers located dealing with water and sanitation. The interest in impact evaluations highlights the importance being placed on developing an evidence base for policies and programs. Despite this increase in the number of impact evaluations in this sector, more still needs to be done to fill in important knowledge gaps and the effectiveness of these types of interventions.

The evidence across all the impact evaluations of water and sanitation clearly shows that programs to improve sanitation, increase handwashing and ensure clean water can reduce intestinal disease among young children.

Almost all of the impact evaluations measured incidence of diarrhea and 78 percent of evaluations found that programs led to a drop in occurrence in young children. The biggest impact was reported in programs that included a component to improve the quality of water—often through purification systems or better storage methods. Close to 70 percent of these evaluations reported a decline in diarrhea. Nearly 50 percent of programs with a component to increase handwashing reported that diarrhea dropped, with similar results for programs that sought to improve sanitation (and reduce

open defecation) and programs with components to improve the supply of and access to water. Likewise, almost half of programs that combined handwashing with improving water quality led to a decline in diarrhea in young children.

While there isn't as much evidence collected on incidences of illnesses such as dysentery, respiratory diseases and influenza, for example, randomized controlled trials of combined programs to encourage handwashing and improve water quality did show significant reductions. But the evidence is mixed. For example, in one of the largest water evaluations to date, examining the effects of the Total Sanitation Program in India, only diarrhea rates, not other water-borne diseases, were shown to have dropped. At the same time, impact evaluations rarely study the effects on widespread waterborne conditions, such as cholera, hepatitis, and adenovirus, although diarrhea may sometimes result from infection from another condition.

Programs generally succeeded at improving the quality of water.

The review showed that 75 percent of impact evaluations that tested bacterial contamination reported strong declines in contamination. Typically, these were programs in rural areas where they collected the water on site.

However, there's still not a lot of evidence on how to change people's behavior, especially when it comes to handwashing.

Washing hands with soap and water is one way to reduce the spread of fecal matter and other contaminants. Encouraging people to do this hasn't been easy. Programs will often incorporate some measure of behavioral changes, specifically around handwashing, to reduce the incidences of diarrhea in young children. These programs usually include an education component to teach people about the importance of washing their hands at critical moments, such as after changing a baby's diaper or before preparing food. While impact evaluations show that these programs usually do improve people's knowledge about when and how to wash their hands, there usually isn't an

increase in people actually washing their hands, even if soap and water is available.

More also needs to be done to understand the effects water and sanitation programs can have on socioeconomic issues like household poverty, income and children's performance in school.

Most evaluations look at health results like diarrhea, but as researchers found, few examine the effects of a water program on education-related outcomes such as school attendance and test performance. Similarly, evaluations often look at a household's spending on water and sanitation, but few look more broadly at potential socioeconomic gains from improved access to water. For example, connecting families to piped-in water might lower household spending because now they don't have to buy water from distributors. A few impact evaluations that researchers reviewed did try to analyze the effect of improved water supply and clean water on employment and broader social opportunities for children, but results were inconclusive. This would definitely be an area where impact evaluation researchers might want to take note. These areas of knowledge may require impact evaluation designs with a long-term perspective of effects.

The systematic reviews show us that when it comes to improving water quality—as measured by a drop in diarrhea—filtration is very effective.

Filtering water to remove contaminants leads to a 60 percent drop in diarrhea rates. Using a system called flocculation—in which the water is gently stirred so that particles stick together and can be removed—can reduce diarrhea by almost 50 percent. Adding chlorine to water leads to around a 25 percent decline in diarrhea.

Overall, the systematic review found that programs to improve water quality—regardless of the method used—led to a 50 percent reduction in deaths from diarrhea; just over a 30 percent drop in diarrhea deaths for young children from the age of one to five years old; a 20 percent decline for children aged one to two months; and a drop of some 30 percent in stunting.

Programs to improve water quality are the most common but an increasing number of researchers are looking at how to effectively combine water and sanitation programs and integrate them with other sectors.

Thirty nine percent of the studies evaluated programs to improve water quality by providing affordable purification treatments and storage options. These programs often were in rural or remote areas with few resources and a small sample size. Hygiene programs account for 17 percent of the evaluations, and water supply comes in third with eight percent, followed by sanitation programs.

Twenty nine percent of all the evaluations were of combination programs, such as those that sought to encourage people to wash their hands with soap and water and to install and use toilets or other improved sanitation. Combined programs can potentially achieve even greater impact on access, health and behavior change because they have similar messages and both handwashing and improved sanitation seek to halt the spread of fecal material.

One thing still lacking in the research is a body of knowledge around scaling up water and sanitation

infrastructure programs—information that is critical to policy makers looking to expand access in especially urban areas.

While research in this field is increasing, it's not happening at the same rate around the world.

About eighty percent of the evaluations were concentrated in just three regions: South Asia, Sub-Saharan Africa and Latin America. More research needs to be done to better understand ways to improve water and sanitation services in under-studied countries across East Asia, the Middle East and North Africa, and Europe and Central Asia, which to date account for just 20 percent of the evaluations. Also, the vast majority—some 67 percent—studied rural communities, with just 29 percent focused on urban populations. More impact evaluations of programs in urban areas would help policymakers understand how to reduce the spread of water-borne diseases in fast-growing cities where, especially in poor areas, infrastructure can be weak or non-existent.

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Conclusion

As the results of this analysis show, much more needs to be done to understand the ways that water and sanitation programs can end extreme poverty and boost shared prosperity. Delineating what we know—and what we don't—is a critical first step to creating better policies and as the survey showed, more rigorous

methods are needed to produce clear, unambiguous results. Indeed, highlighting the gaps in our knowledge helps carve out a clearer path ahead so that researchers, along with the broader development community, better understand where to focus their efforts and resources in the years ahead.

The Strategic Impact Evaluation Fund, part of the World Bank Group, supports and disseminates research evaluating the impact of development projects to help alleviate poverty. **The goal is to collect and build empirical evidence that can help governments and development organizations design and implement the most appropriate and effective policies for better educational, health and job opportunities for people in developing countries.** For more information about who we are and what we do, go to: <http://www.worldbank.org/sief>.

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