A Brief Summary of Global WASH Interventions

What Works and What Doesn't

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WASH practitioners and decision-makers lack evidence on the wider health and social effects of WASH interventions needed to create a paradigm shift in the sector. A global overview and meta-analysis on the effects of different WASH interventions on different health and socioeconomic outcomes was undertaken. The results of this analysis show that evaluations of WASH interventions continue to focus predominantly on reducing diarrheal disease and there is a strong need for larger, more rigorously designed studies covering a broader scope of outcome effects. Similarly, there is a need for greater geographical representation and finally, well-trained implementing agencies to achieve the desired results.

Background

The effects of water supply, sanitation and hygiene (WASH) interventions on the reduction of diarrheal disease in children have been thoroughly documented, however, evidence evaluating the effects of WASH interventions on other outcomes of health and well-being, such as school attendance and growth, is sparse. WASH interventions, and consequently the studies designed to evaluate their effectiveness, have similarly

The purpose of this study was two-fold: (1) to collate existing evidence on global WASH interventions into a single, publicly available repository and (2) to quantify the effectiveness of a broad range of WASH interventions on an array of outcomes through a quantitative meta-analysis of impact evaluation (IE) studies.

focused on water quality, while relatively little is known about the effectiveness of other interventions, such as sanitation and hygiene. Given the magnitude of people impacted globally, time, and resource constraints, policy makers often face challenging decisions when tasked with allocating resources to WASH programs.[1] **Understanding the evidence supporting the effectiveness of different WASH interventions on different outcomes of health and socioeconomic well-being is imperative to optimizing results and improving the performance and sustainability of WASH programs in the long run.**

Sample

An extensive search of published IEs was undertaken. A key word analysis was then applied and only papers using accepted IE methods were included, resulting in a final dataset of 136 IE studies. More than 50 percent of all studies were published after 2008. Geographical representation appeared to mirror the lack of services globally, and more than 80 percent of all studies were concentrated in three regions: South Asia (34 percent), Sub-Saharan Africa (27 percent), and Latin America and the Caribbean (18 percent). Similarly more than two-thirds of all evaluations were conducted in rural areas. Water quality was the most commonly assessed WASH intervention, accounting for 39 percent, followed by hygiene (17 percent), water supply (8 percent), and sanitation (7 percent). Finally, more than half of all studies targeted incidence of diarrhea in children as an outcome.

An IE is an assessment tool for determining whether an intervention works while also assessing program design. Properly conducted IE provide high quality evidence that help orient investment decisions, improve design policies, adjust ongoing interventions, and increase transparency and accountability. To ensure the integrity of this review, only evidence-based IE were included, that is, studies that employed accepted research methods to rigorously measure impacts attributed to WASH interventions.

Meta-analysis is a statistical tool that pools results from individual studies into a combined estimate of overall effects from different programs. The aggregate effects and conclusions of a meta-analysis are nonetheless based on the quality of the individual studies included.

Discussion

To facilitate the meta-analysis,[2] studies were divided into five thematic groups based on expert review and according to outcome: (1) behavior change, hygiene, and sanitation; (2) growth, health, and mortality in children combined with other infectious diseases; (3) cognitive skills and school absenteeism; (4) access to water and water quality; and (5) diarrhea and enteric diseases.

There has been a large increase in WASH-related IEs over the past decade. Studies have been concentrated in the most underserved areas globally while East Asia, Europe and Central Asia, and the Middle East and Northern Africa regions remain under represented. Despite a large increase in studies evaluating combined WASH interventions, few evaluations target multi-country or multi-sector interventions. As a whole, water quality interventions dominate IEs, especially in Sub-Saharan Africa and Latin America and the Caribbean. This finding is not surprising given the more quantitative nature of water quality interventions making them suitable for experimental methods.

Despite a relatively high number of unique outcomes (21) reported in the 136 studies, more than half of all evaluations focused on diarrhea and this review corroborates

earlier findings (Cumming et al. 2014; Hutton and Chase 2017) that positive effects for diarrhea reduction are well-established and thoroughly documented, particularly for hand washing with soap and water quality trials. However, while experimental designs resulted in significant effects, quasi-experimental designs did not produce the same results.[3]

Evidence from the individual (non-pooled) studies for behavior change and other health-related outcomes, e.g. child mortality, stunting, height, and weight is limited, and predominantly observed in single studies although small-scale studies evaluating combined interventions did report weak, but significant results for changes in child mortality and stunting. Moreover, while a range of WASH interventions were frequently employed to control cholera outbreaks, few programs have been evaluated using rigorous IE techniques thereby limiting the ability to draw conclusive evidence. Further, there is a clear distinction between program effects from stand-alone WASH interventions versus programs that are designed to target multiple WASH themes. For example, the evidence for water quality in single interventions using experimental designs is solid, yet less so in combined interventions, including sanitation and hygiene. Finally, IEs specifically focused on child health outcomes showed heterogeneous effects.

The pooled effects of WASH interventions on school absenteeism were significant. The odds of missing school were *considerably reduced* (30 percent) for students having received a WASH intervention. Similarly, children were significantly *more likely* to use soap (1.44 times) and *less likely* to develop Ascaris infections (0.5 times), diarrhea (0.65 times), and die (0.91 times), as children not having received a WASH intervention. Finally, child growth, hand washing, and latrine adoption increased by 26, 8, and 22 percent respectively and water quality improved by 20 percent.

In certain circumstances, research methods can significantly influence outcome effects. In particular, randomized controlled trials (RCTs)—the gold standard for establishing a causal attribution between interventions and outcomes—tend to estimate larger and more precise effects. In some cases, study locale (e.g. urban versus rural) was found to affect the reliability of results; however, this varied by outcome and could not always be explained by other study characteristics. For example, though WASH interventions targeting behavior change and sanitation produced more robust effects in urban areas, this was also a function of study design, given the studies conducted in urban areas applied experimental methods, which was shown to improve results. On the contrary, WASH interventions targeting reduced incidence of diarrhea and enteric-related diseases conducted in rural areas produced more precise results than interventions in urban areas. This is despite the fact most interventions in urban areas had been implemented by NGOs, which were shown to improve the accuracy of results when compared to government agencies. This could be explained by reinfection rates, which are typically higher and/or impact more people in densely populated, urban areas. However, given the potential bias in this group, results should be interpreted with caution.

Conclusions

In general, evaluations that encompass large numbers of studies with rigorous (experimental) research methods produce more precise results. This was the case for studies evaluating effects on behavior and sanitation outcomes. Improving study design specifically in rural areas for these outcomes might be one area for future research, while increasing the number of studies in urban areas with high population density could generate economies of scale. There is a wide range of qualitative approaches that can be employed in combination with quantitative methods to strengthen effects. However, there is a trade-off[4] between the internal and external validity of WASH IEs that should be taken into account when designing studies. More research needs to be undertaken on hygiene and

sanitation interventions overall and greater geographical representation is needed. Finally, additional research is needed to better understand the impacts of study locale on the results of WASH interventions targeting reduced diarrhea and enteric diseases. The effects of multiple interventions, especially in combination with behavior change initiatives, would also benefit from additional research. Specifically, there is a need to ensure a consistent approach to undertaking IEs. For example, outcome effects—and not just the combined effect—should be reported for each intervention as this has implications for the design, number and composition of comparison groups (treatment and control). There are grounds to suggest capacity-building efforts in government implementing agencies would lead to more reliable results, which also supports the argument for a better, more cohesive approach to conducting IEs.

Clearly, more evidence is needed to support the emerging understanding of the wider health and social effects of WASH interventions. In summary, all findings seem to point to the need for larger studies, with broader geographical representation and rigorous research methods, in addition to well-trained trained implementing agencies.

Notes

1. Conducting a systematic review and meta-analysis on a single outcome is a time-consuming endeavor. Expanding efforts to include the array of global studies evaluating a diverse set of WASH outcomes is exponentially more laborious, as illustrated by the time lag between the commencement of this study and the publication of results. Although many reputable impact evaluations and meta-analyses evaluating the effects of WASH interventions on single outcomes have been published since this study began in 2013, this study remains the first of its kind to compare the effects of WASH interventions on diverse health and non-health outcomes through a combined meta-analysis.

2. Aggregating outcomes ensured there was sufficient variation in sample sizes, effects, and standard errors to conduct the meta-analysis, while increasing the statistical power.

3. For instance, these studies reported that a recent meta-analysis of five randomized controlled trials found a mean difference of 0.08 in height-for-age z-scores of children under age five (95 percent CI: 0.00-0.16) for solar disinfection of water, provision of soap, and improvements in water quality (Dangour et al. 2013).

4. See, for instance, Pritchett and Sandefur (2013), who state the trade-off with nonexperimental estimates of treatment effects comprise a causal treatment effect and a bias term due to selectivity. When non-experimental designs and estimates vary across contexts, any claim of external validity must make the assumptions that (a) treatment effects are not the same across contexts, and (b) selection processes vary according to contexts. Therefore, parameter heterogeneity will not come from economic or institutional factors that make external validity implausible.

References

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