



Water and sanitation interventions: The need for a more integrated approach?

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Is the whole question of groundwater quality versus on-site sanitation actually misleading? Are there more fundamental problems we need to address?

Millions of people, mainly in the South, do not have access to adequate water and sanitation (UNICEF, 1998*), contributing to the large burden of disease, particularly among children. The solution seems obvious — if households can be provided with adequate water and sanitation, the transmission of faecal-oral diseases should be dramatically reduced. In practice, however, there are numerous problems in the provision of environmental services for all. These include conflicting priorities within and between communities, planners, politicians and funders; problems in financing, installing and maintaining services; and the challenge of balancing social, economic and health costs and benefits.

In this article we discuss the risks and benefits of sanitation interventions (over and above the concerns of water quality). We go on to look at the importance of understanding local needs, and then advocate the need for integrated approaches to service and environmental planning.

Separating interventions

A number of studies have attempted to estimate both the separate and joint health effects of improvements to water supply and sanitation in developing countries. While attempting to measure separately the effects of different interventions appears useful, it raises a number of issues.

First, such measurements usually fail to take into account the multiple transmission routes for faecal-oral diseases which can result in significant interactions between water and sanitation interventions. For example, the health impacts from an improved water supply may depend on sanitation conditions within the household, on hygiene practices, and so forth (VanDerslice and Briscoe, 1995; Cairncross and Kochar, 1994).

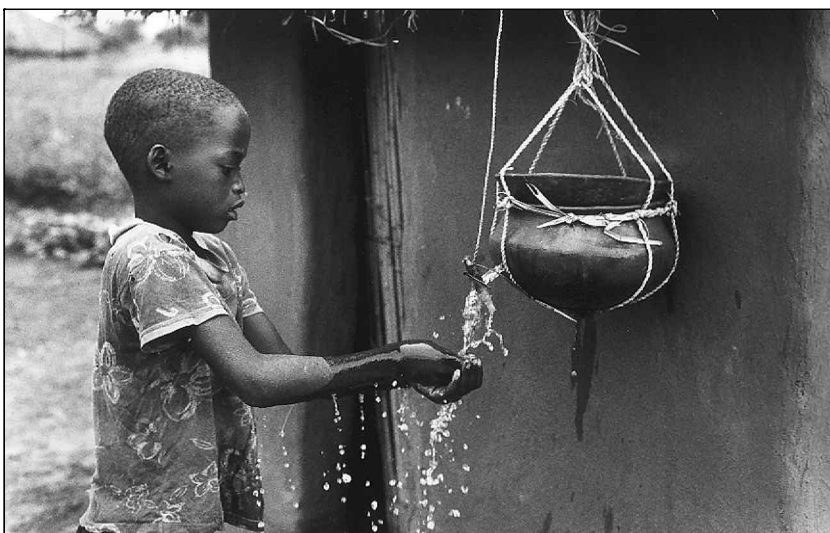
Secondly, latrine owners tend to be better off than non-owners, are more likely to use improved water sources and larger quantities of water, and are more likely to report good hygiene practices (Daniels *et al.*, 1990). Furthermore, households which access one form of environmental improvement are more likely to access others, leading to cumulative health benefits.

Thirdly, the interactions between the interventions may vary from one setting to another, so are difficult to measure. Where interactions are present, but are not taken into account in an impact study, then too little impact may be attributed to an earlier intervention, and too much to the later intervention which will pick up the separate and joint effects of both (VanDerslice and Briscoe, 1995).

Impacts on health

These problems indicate that, to a large extent, the separation of the effects of interventions is artificial. Bearing this in

* See Resources Guide on page 27 for those references which do not appear as endnotes.



A girl washes her hands outside a latrine, Malawi. Water quality may be less important than the quantity; access to large volumes of water can lead to increased use for hygiene purposes.

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on-site sanitation and groundwater quality

mind, Table 1 summarizes the findings of a systematic review of published studies which examined the reductions in diarrhoeal disease morbidity following improvements in one or more components of water and sanitation.¹ It is important to note that these figures are compiled from a range of studies in different settings, using different interventions and methods, and are presented here to give a broad indication of the potential effectiveness of the interventions concerned. Effectiveness in the field may, of course, differ from that outlined (Lewin *et al.*, 1996). Diarrhoeal disease is used as an example as it is the largest contributor to the disease burden of the faecal-oral diseases.

Table 1 indicates that larger reductions in diarrhoeal disease morbidity were shown following sanitation improvements and hygiene interventions, such as handwashing, than following improvements in water quality or quantity. Studies examining the combined effects of water and sanitation showed reductions similar to those for sanitation and hygiene alone, possibly because of interactions between interventions, as discussed above.

From this table, one might conclude that improved water quality alone has a substantially lower impact on diarrhoeal disease than improved sanitation. There are two possible reasons for this. First, there is evidence that improving water quality at source may not ensure a reduction in the transmission of water-related diseases. A number of studies (Genthe *et al.*, 1997; Mertens *et al.*, 1990; Verweij *et al.*, 1991; Lindskog and Lindskog, 1988) have shown significant deterioration in water quality between the source and the point of use, indicating contamination of water during collection and storage. This contamination appears to be more severe where the water source is outside the home (i.e. private outdoor and communal taps). Improvements in water quality alone would therefore be expected to have little impact on diarrhoea in highly contaminated neighbourhoods.

Secondly, water quality may be less important than the quantity of water available to the household. Such availability is associated with child health benefits, and can lead to increased water use for hygiene purposes (Cairncross, 1987; Aziz *et al.*, 1990). However, household water consumption remains

largely the same until the source is within the compound or home, when it rises exponentially, often to more than four times previous volumes (Cairncross and Cliff, 1987). This evidence suggests that water quality receives too much attention relative to the role of water in 'washing away' pathogens.

<i>Intervention</i>	<i>Rigorous studies²</i>	
	<i>No.</i>	<i>Reduction (%)</i>
Water quality	4	15
Water quantity	5	20
Water quality and quantity	2	17
Sanitation	5	36
Water and sanitation	2	30
Hygiene: personal and domestic	6	33
ALL STUDIES	19	26

Table 1: Median reductions in diarrhoeal disease morbidity from improvements in one or more components of water and sanitation.¹

Implications of the studies

Does this mean that groundwater quality concerns should take second place to providing adequate sanitation? While Table 1 indicates that the impacts of improved sanitation are greater than those of improved water quality, research has also shown that these impacts are dependent on other conditions. Some studies have indicated greater benefits among non-breast-fed infants and among infants of illiterate mothers.¹ Others have shown that the impact of latrine ownership on diarrhoea is greater in households where the mother has a higher level of education, where handwashing after defecation is reported, and where larger quantities of water are used (Daniels *et al.*, 1990). These seemingly contradictory findings are not surprising — a range of factors can affect the use, and therefore the impact, of latrines. As Table 1 illustrates, hygiene improvements can have substantial effects on diarrhoeal disease morbidity, although the effectiveness of different types of health education intervention to promote hygiene improvements is still unclear (Loevinsohn, 1990). In order to achieve the greatest impact, therefore, both water and sanitation interventions need to be tailored to local conditions and practices, and need to incorporate hygiene promotion strategies that encourage appropriate behaviour.

The wrong question?

Perhaps, then, the question of whether groundwater quality should be prioritized above sanitation in areas where there is a risk of contamination is misleading. First, the benefits and disadvantages of environmental interventions are affected

1. Esrey, S.A., J.B. Potash, L. Roberts and C. Shiff, 'Effects of improved water supply and sanitation on ascariasis, diarrhoea, dracunculiasis, hookworm infection, schistosomiasis, and trachoma', *Bulletin of the World Health Organisation*, 69(5): 1991, pp.609-62.
2. Esrey *et al.*, (1991) report that studies were excluded from the rigorous category if they had a single major, or several minor, flaws that may have led to bias in the results. Criteria for this process are reported in S.A. Esrey and J.P. Habicht, 'Epidemiologic evidence for health benefits from improved water and sanitation in developing countries', *Epidemiology Review*, 8: 1986, pp.117-28.
3. Stephens, C. 'What's health got to do with it? Using environmental health to guide priority-setting towards equitable environmental management in cities', in A. Atkinson, J. Davila, E. Fernandes and M. Mattingly (ed.) *The Challenge of Environmental Management in Urban Areas*. Ashgate, Aldershot, forthcoming 1999.



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Health education, Bangladesh. Understanding people's own perceptions and concerns about health and their environment is vital.

by a range of factors and will therefore vary greatly from one area to another. In addition, there is evidence that improvements in both water and sanitation give greater benefit than improvements in one facility alone.¹ By focusing purely on water quality, for example, synergies with other interventions may be lost. Then there are 'operational' synergies between water and sanitation, as water helps to dispose of excreta adequately. Finally, in the absence of adequate sanitation facilities, open defecation is common and poses obvious health risks, particularly to infants. An integrated approach to water, sanitation and hygiene interventions is therefore necessary in the provision of basic environmental services.

Integrated approaches

So what does 'integrated' mean? Where do communities fit into these decisions on service provision?

Although there is much advocacy for the need to involve communities in planning services, putting this into practice is not always easy. Planners are generally concerned with their own sectoral issues, such as water supply, health care, social services or housing, and tend to see these as the most important concerns; residents' concerns and problems may not fit into this narrow sectoral framework (Lewin *et al.*, 1998).

An innovative strategy in Calcutta — the Calcutta Environmental Management Strategy and Action Plan (CEMSAP) — tried to address the issue of poverty centrally, going beyond technical improvements to the physical environment. In CEMSAP it was

recognized that, in order to mitigate many environmental problems, it was necessary to address underlying economic and social processes. Communities' perceptions of environmental degradation were sought in a process which highlighted the fact that different groups had very different priorities. More importantly, the poorer groups in the city did not want to select individual interventions, but focused on the underlying reasons for their lack of access to services.

However, engineers and health planners may not agree with local communities as regards environmental priorities. In another study, which examined community perceptions of the risks of flooding in an Indian town, neither flooding nor inundation were seen as major problems in flood-prone areas compared to the perceived advantages of location — access to markets, employment and community networks. For communities, environmental issues may rank low compared, for example, to the importance of a secure livelihood; residents may make decisions which appear illogical to engineers or planners as a result (Stephens *et al.*, 1994).

Probably the most important problem with involving communities in planning decisions is that many lack the power to bring their demands into the decision-making process. These marginalized groups are often those most in need of environmental interventions (Cairncross *et al.*, 1998).

Community participation

The physical improvement of the environment through effective engineering interventions is a necessary, but not sufficient, approach. Understanding people's own perspectives on their environment and health concerns is also a vital step in bringing about appropriate improvements. These perspectives need to be integrated with information on the effectiveness of different interventions, or packages of interventions. In parallel with this process, communities need to have access to information on the risks, benefits and costs of different packages of interventions so that they can actively participate in the decision-making process. Appropriate, accessible and effective ways of providing such information need further exploration. ■

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