

Water and health

Parasites and related interactions in rural water resources

A WRC-funded study investigated parasites and related interactions in water resources and rural communities.

Rationale and scope

This study was motivated primarily by the basis of limited current data on the degree to which parasitic organisms (helminths, *Cryptosporidium*, *Giardia*, *Cyclospora* and *Isospora*) occur in water resources and sewage treatment plants in the Limpopo Province. The study also included an examination of selected local socio-economic characteristics and the physico-chemical characteristics of water resources used for drinking water. It also examined the participative “photovoice” method which allows local community members to communicate their concerns relating to their water sources.

Socio-economic results

The socio-economic study involved 914 households in 22 rural villages in five districts (Capricorn, Mopani, Sekhukhune, Vhembe and Waterberg) with the data collected by questionnaire. The data indicated that about one third of households used unsafe water sources and that about 58% of households were more than 100 m from their water source. A total of 41% of the households perceived their water as salty and 12.5% of households had at least one person who had had diarrhoea in the 3 months prior to the study. About 30% did not think they could get sick from water.

Physico-chemical and microbiological results

The study measured pH and turbidity and examined the occurrence of helminths (parasitic worms), *Cryptosporidium*, and *Giardia* (both parasitic protozoa) in the influents, an intermediate treatment stage and final waters in six sewage treatment plants once a month for nine months. The occurrence of *Cyclospora* and *Isospora* (also parasitic protozoa) were also examined to a limited extent.

Helminths were found in the influents of all plants at least once (on average in 52% of samples) and were not detected at all in the final treated waters of only two plants (on average in 21% of samples).

Cryptosporidium was completely eliminated in 60% of all occasions in which influent and final waters were sampled (samples taken on the same day). *Giardia* was also not completely removed in some plants. Plants with biological filters generally had higher removal efficiencies than those with activated sludge for all four protozoa.

The chemical water quality in the natural water sources used for drinking water and some drinking waters was examined. 11% of samples had turbidity > 5 NTU, including some borehole waters. The pH of samples varied from 5.1 to 9.0. Fluoride, chloride, nitrate, phosphate, cadmium and lead had mean concentrations of 0.14 mg/l, 107 mg/l, 96 mg/l as N, 65 mg/l as P, 7.7 µg/l and 22 µg/l respectively. They had maxima of 2.9 mg/l, 727 mg/l, 405 mg/l as N, 342 mg/l as P, 49 µg/l and 62 µg/l respectively.

Giardia and *Cryptosporidium* were also determined in raw water sources, including boreholes, and one community tap. About half of the raw water sources were found to have either *Cryptosporidium*, or *Giardia* genotype A or B. The single tap sample was found to have *Cryptosporidium*. The majority of the 8 river sediment samples were positive for *Cryptosporidium*, three were positive for *Isospora*, none was positive for *Cyclospora* and all were positive for *Giardia*.

“Photovoice” results

The photovoice method involves allowing local community members to photograph scenes relating to their water sources that illustrate their water-related concerns and then record a statement that explains these concerns. Various

issues were identified, including compromised water quality and general availability of water. The technique seemed well received by the local community.

The following figure and caption is illustrative:



"In this photo I see a shortage of water because in this well water gets finished sometimes and we have to wait for the water and I found that people of this community use this well."

Conclusions and recommendations

The study demonstrated that helminths and protozoan

parasites were not always effectively removed by sewage treatment plants and were also found raw water sources.

The "photovoice" method provided a simple and useful mechanism for local communities to communicate their water-related concerns.

Although the local population is aware of hygiene and sanitation issues, the level of contamination found in this study emphasizes the ongoing importance of awareness and education campaigns.

Further work could be undertaken to better characterize the sources of contamination, the degree of interaction between surface waters and groundwater, and the relation between the occurrence of parasitic organisms and actual infections in the local population.

Further reading:

To obtain the report, *Parasites and Related Interactions in Water Resources and Rural Communities* (**Report No: 1910/1/11**) contact Publications at Tel: (012) 330-0340; Fax: (012) 331-2565; Email: orders@wrc.org.za or Visit: www.wrc.org.za to download a free copy.