A Field Assessment of BioSand Filtration in Rural Ghana

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It is estimated that over one billion people worldwide still lack access to safe drinking water, and that far more drink water that is grossly contaminated. Approximately one-third of this is accounted for in Sub-Saharan Africa, of which the Republic of Ghana is part. The WHO estimates that 36% of rural Ghanaians, or eight million, are without access to an improved drinking water supply. Some communities like Sibi Hilltop – located in a remote area of the country between the northern end of Lake Volta and Togo – have one or more boreholes that pump water some of the time; however, these sources cannot yield enough clean water for the demand of the entire community. Even if they could, some households would continue to fetch from the streams and dam for various reasons. Contaminated drinking water is part of the reason for approximately 1.8 million deaths each year in the world caused from diarrhea-related disease, the majority being children under five years of age. A recent policy shift in public health, supported by field studies and literature, has moved toward household point-of-use water treatment as an effective intervention to combat this problem.

As an adaptation of slow sand filtration, the intermittent BioSand Filter was invented by Dr. David Manz in 1995 specifically with household use in mind. Since then over 200,000 concrete BioSand Filters have been constructed and installed in over 70 countries, and numerous field tests have shown it to be an attractive point-of-use treatment option. However, its limitations of being very heavy and having a slow construction time remains a barrier to wider implementation. Overcoming these specific obstacles, the HydrAid TM BioSand Water Filter has been developed as a light weight alternative made from injection-molded plastic for efficient production.

For this study twelve HydrAid TM BioSand Water Filters were installed in Sibi Hilltop and monitored over the course of two months by the author, a Peace Corps Volunteer living in the community. A field assessment of the best methods of installation, flow rates, water quality, user acceptability and comprehension, health impacts, and comparison between the HydrAid TM and concrete model was completed. An additional forty-one filters were installed during the last two weeks of the study. The results of the study show that the filter is an effective point-of-use water treatment technology for Sibi Hilltop, Ghana, and suggests that it would be an attractive option for similar communities in West Africa. The installation guidelines – developed to provide specific information about media preparation, assembling of the filter, and installation processes – can be used by implementing agencies to efficiently install large numbers of filters in the field. At installation the filters had an average flow rate of 0.96 L/min that decreased over the two month period to roughly 0.61 L/min. With a mature biolayer, the average removal efficiencies for Total and Fecal Coliforms were 84% and 86%, respectively. However, one-third of the filters tested showed removal efficiencies of 100% for both. Surveys conducted with the twelve households in October 2007 indicate a high user acceptance and a moderate to high user comprehension of the filter. The HydrAid TM BioSand Water Filter has improved in terms of production, distribution and user-preference but remains limited by cost, durability and project sustainability, when comparing it with the traditional concrete BioSand Filter.