



Water Quality of Capped Springs (improved water sources) in Rural Democratic Republic of the Congo

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7th RWSN Forum, 31 October 2016, Abidjan, Côte d'Ivoire



Introduction



The Democratic Republic of the Congo (the Congo) failed to meet (officially, "limited or no progress") its Millennium Development Goals (MDGs) of halving the number of people without access to an improved water source. Although urban access to an improved water source approximates 81%, rural access lags miserably behind at only 31%. And rural access to improved water sources is primarily provided through protected natural water springs. Congo Helping Hands (CHH) was contracted by IMA World Health (IMA) via their funded project with the Department for International Development (DFID) to assess the water quality of improved water sources. Overall, the project aims to improve the basic health of about 9,000,000 people in 52 rural Health Zones in the Congo. Also, CHH evaluated alternate field water quality testing methods.

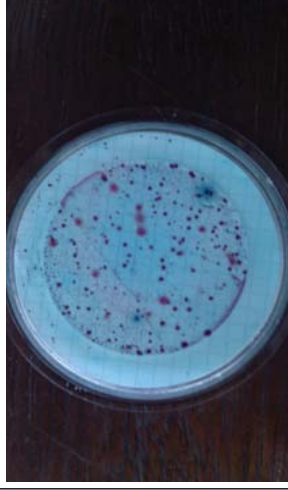
[For References, Documents, and Reports, visit <https://goo.gl/Ss0zM7>]

Methods



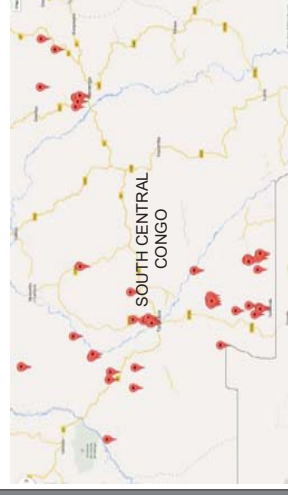
From October 2013 to December 2014, Congo Helping Hands performed field water quality tests of improved water sources in rural Congo. Primarily, field water tests were conducted using a Membrane Filtration Water Test kit (Hach m-Colilblue24 agar, Millipore Microfil stand, Millipore Microfil funnels, Millipore Microfil filters, Pall Petri Dishes, Nasco Water WhirlPaks, and Hach Portable Incubator). In addition to the Membrane Filtration Water Test kit, the team required five solar panels, three solar charge controllers, three 12-volt solar batteries, and a 12-volt portable refrigerator to perform the field water quality tests. Secondly, we field tested the Aquagen's Compartment Bag Test (CBT) and Dr. Robert H. Metcalf's Portable Microbiological Laboratory (PML) water quality test kits for ease of use and simplicity in the rural Congo setting. We evaluated the time to prepare a water sample for testing along with the ease and simplicity of use. Also, we evaluated the time required to analyze and interpret the water quality test results.

Results



All water samples were collected and processed within six hours and incubated for 24 hours. Using the Membrane Filtration Test Kit, we were able to quantitatively enumerate E.coli and Total Coliform colony forming units (CFUs). CHH's team selected and tested a statistical sample of 67 improved water springs in 15 rural Health Zones. Our test disclosed that the only 63% of the improved springs had reasonable water quality; that is, 10 or less CFUs per 100 ml of water. But 32% were polluted (11-100 CFUs) and 5% were dangerous (101-1000 CFUs). Therefore, this water should be treated before drinking to reduce the risk of waterborne disease. A limited number of tests were performed with the CBT and PML test kits (10 and 25 tests, respectively). Both the CBT and PML water quality test kits performed well under rural field conditions. The PML samples required less time to prepare. Also, the PML samples were easier and simpler to use. However, the CBT samples required less time to analyze and interpret.

Conclusions



First, an improved water source does not insure safe drinking water. That is, 37% of the water from improved sources require treatment prior to consumption. Second, water quality monitoring and testing can be time-consuming, require expensive equipment where electricity is non-existent or limited. Low-income, developing countries like the Congo can not afford or have the ability to routinely perform advanced microbiology water quality testing. Overall, we concluded that water quality monitoring and testing must be community-based. Ease of use, simple and affordable water quality testing kits are needed that require no electricity or refrigeration. Both CBT and PML test kits were better suited for field conditions in rural Congo than a membrane filter system. Based upon our conclusions, in August 2016, IMA World Health started deploying the PML water quality testing kits to 28 Health Zones in rural Congo. As a result, health officials will be able to routinely test and monitor water quality of improved sources.