

Continuous water supply: a decisive factor in the fight against cholera

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Operational lessons drawn from five years of epidemiological research in the Democratic Republic of the Congo

- ▶ Diarrhoeal diseases, including cholera, remain a major public health problem in populations without access to safe drinking water.
- ▶ Research conducted in Uvira in the Democratic Republic of the Congo (DRC) highlights the importance of a safe and continuous supply of drinking water.
- ▶ Investment in drinking water supply is a central pillar of cholera prevention strategies and also prevents various other important diarrhoeal diseases.

Context

Around 2.4 billion cases of diarrhoeal disease were recorded globally in 2015, causing approximately 500,000 deaths among children under five. Over 60% of these deaths were attributed to poor access to water and sanitation. Cholera is an acute diarrhoeal disease which, if left untreated, can lead to death within hours. Each year, 1.3 to 4 million cases and 95,000 deaths – half of them affecting children under the age of five – are estimated to be due to cholera. In sub-Saharan Africa, more than half of all cholera cases occur in “hotspots” accounting for less than 4% of the total population. The Global Task Force on Cholera Control (GTFCC) strategy targets these hotspots. Uvira, South Kivu province, is a town of 280,000 inhabitants and is identified as hotspot, with endemic cholera transmission. Since 2013, the Agence française de développement (AFD) and the Veolia Foundation, with the support of the European Union and Oxfam, have invested nearly 15 million euros in improving the water supply network. The water treatment and pumping station has been modernized and a new storage tank has been built. Work is under way on other aspects of the project, including the installation or rehabilitation of 7.4 km of structural pipes and the extension of the network with 36.3 km of new pipes, the commissioning of 102 standpipes, the installation or rehabilitation of 3,000 individual connections and hygiene promotion activities. From the inception, a research team from the London School of Hygiene and Tropical Medicine (LSHTM), in partnership with the Cholera Treatment Centre (CTC), has led a rigorous evaluation of these improvements to water supply in Uvira to document the changes and to assess the impact on cholera and other acute diarrhoeal diseases^[2]. The first results from the research led by LSHTM highlight

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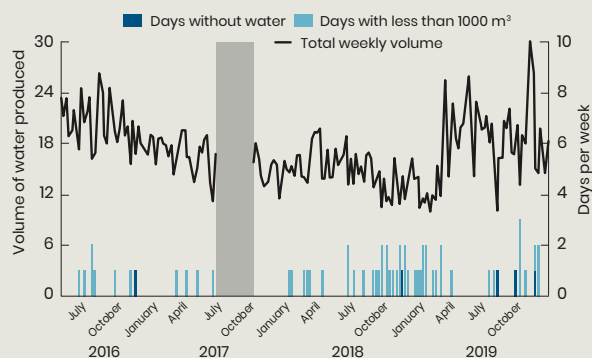
[1] This document is the result of the joint analysis of previously published scientific results carried out by the participants in the project: Agence française de développement (France), Veolia Foundation (France), the London School of Hygiene and Tropical Medicine (United Kingdom), and the Uvira Health Zone (DRC).

[2] Gallandat K, Jeandron A, Ross I, Saidi JM, Rumedeka BB, et al. The impact of improved water supply on cholera and diarrhoeal diseases in Uvira, Democratic Republic of the Congo: A protocol for a pragmatic stepped-wedge cluster randomized trial and economic evaluation. *Trials* 2021. <https://doi.org/10.21203/rs.3.rs-61607/v1>.

Policy Brief

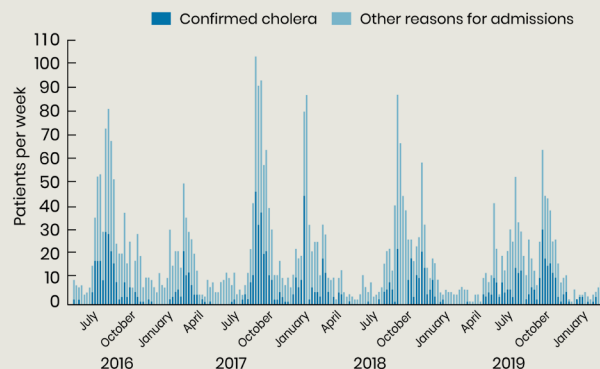
WATER PRODUCTION AND CHOLERA IN UVIRA, DRC

VOLUMES OF WATER PRODUCED FOR THE CITY OF UVIRA (in grey: missing data)



Sources: London School of Hygiene and Tropical Medicine, REGIDESO, Uvira Health Zone.

CONFIRMATION OF CHOLERA CASES AT UVIRA GENERAL HOSPITAL CHOLERA TREATMENT CENTRE



two lessons: (i) the importance of maintaining the continuity of the water supply, and (ii) the importance of other causes of acute diarrhoeal disease, beyond cholera

Guaranteeing the continuity of the water service

An analysis of the number of admissions to the CTC with the volumes of water distributed by the network in Uvira between 2009 and 2014, found that over the 12 days following an interruption in the supply of drinking water, the number of patients admitted at the CTC increased by an average of 155% [3]. Recent data on the variability of the volumes of water produced in Uvira is presented in the graph.

There are several possible reasons for this. When there is an interruption in the water service, households may use alternative potentially contaminated water sources such as rivers or Lake Tanganyika. In addition, a lack of water may limit hygiene practices and promote disease transmission. Finally, contamination of the network cannot be excluded, for example due to system infiltration when there is insufficient pressure or through the development of biofilms protecting cholera bacteria.

Regardless of the mechanism at work, the importance of mitigating service interruptions is clear. In Uvira, the main challenge to continuity of service is the electricity supply for the drinking water production plant. Doubling production and storage capacity should reduce the impact of frequent power outages. However, this problem highlights the multisectoral nature of these public health challenges, spanning water supply infrastructure but also the energy sector.

Fighting against all diarrhoeal diseases

As part of the project, the confirmation of cholera by rapid tests has been introduced at the CTC since 2016 [4] and shows that only 40% of admitted patients have cholera (see graph). Analysis of stool from 269 patients revealed the presence of other pathogens which cause diarrhoea among

45% of the samples [5]. Identifying these circulating pathogens can guide broader disease prevention strategies. For example, the *Cryptosporidium* parasites detected in 28% of Uvira patient samples are resistant to chlorine so other water treatment approaches will be appropriate combined with sanitation and hygiene measures. The diversity of enteric pathogens detected among CTC patients in Uvira underlines the relevance of strategies to improve access to basic services, effective not only against cholera, but also against other diarrhoeal diseases.

Implications

These early insights generated by the Uvira project can support strategies to reduce cholera transmission in hotspots and also prevent other diarrhoeal diseases. The future results of the evaluation of the impact of improvements to the water supply system in Uvira will provide new information to guide investments in large-scale infrastructure to prevent cholera and combat diarrhoeal diseases more broadly.

[3] Jeandron A, Saidi JM, Kapama A, Burhole M, Birembano F, et al. Water Supply Interruptions and Suspected Cholera Incidence: A Time-Series Regression in the Democratic Republic of the Congo. *PLOS Med* 2015; 12: e1001893. <https://doi.org/10.1371/journal.pmed.1001893>.


[4] Jeandron A, Cumming O, Rumedeka BB, Saidi JM, Cousens S. Confirmation of cholera by rapid diagnostic test amongst patients admitted to the Cholera Treatment Centre in Uvira, Democratic Republic of the Congo. *PLOS ONE* 2018; 13: e0201306. <https://doi.org/10.1371/journal.pone.0201306>.

[5] Williams C, Cumming O, Grignard L, Rumedeka B, Saidi J, et al. Prevalence and diversity of enteric infections among Cholera Treatment Centre patients with acute diarrhoea in Uvira, Democratic Republic of the Congo. *BMC Infect Dis* 2020; 20. <https://doi.org/10.1186/s12879-020-05454-0>.

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